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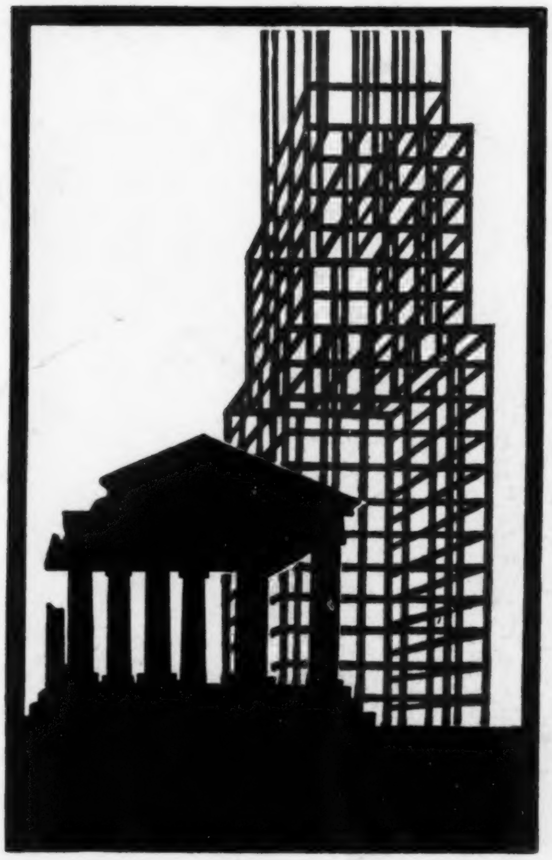

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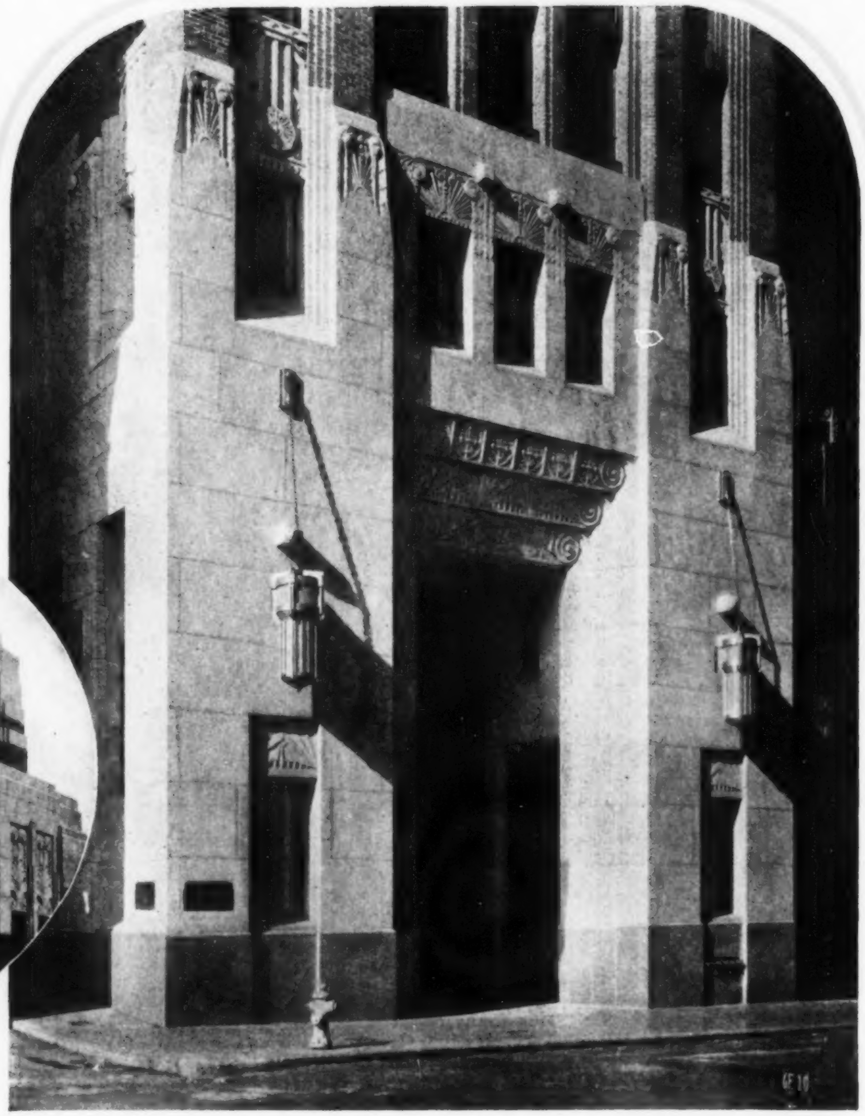

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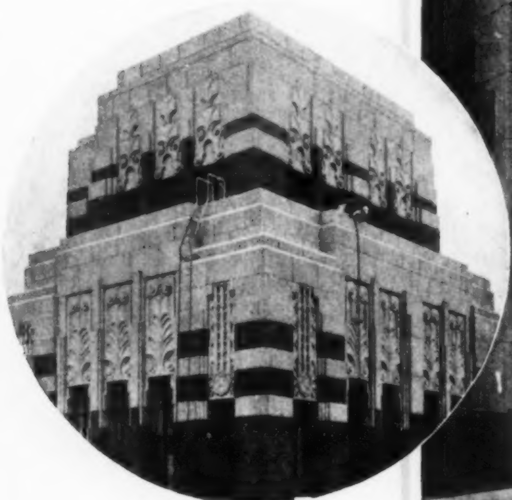

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THE ARCHITECTURAL RECORD

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ARCHITECTS' ANNOUNCEMENTS AND CALENDAR

Miss Margaret Vredenburgh Van Pelt, who is a registered architect in New York and New Jersey, has joined the architectural firm of her father, John V. Van Pelt, 126 East 59th Street, New York. Miss Van Pelt has just returned from a year of study in Europe. She is a graduate of Vassar College, Columbia University, and Massachusetts Institute of Technology.

John T. Simpson, architect and engineer, has removed his offices from 45 Walnut Street to 744 Broad Street, Newark, N. J., where he will continue the practice of architecture.

E. C. Landberg, architect, announces the removal and consolidation of his Newport, Kentucky, office with his Cincinnati, Ohio, office, which will be located at 114 Garfield Place, Cincinnati.

Paul W. Hofferbert, architect, announces a change of address from Room 215, American Bank Building, to 748 Forest Avenue, Gadsden, Alabama.

The firm of Ferguson and Auer, Inc., has been organized for the general practice of architecture. The organization will have offices at Room 615, 1900 Euclid Building, Cleveland. Officers of the company are W. S. Ferguson, president; H. E. Auer, vice-president and treasurer; and H. M. True, secretary.

M. Joseph Harrison and Irving M. Fenichel announce the consolidation of architectural offices, to be known under the firm name of Harrison-Fenichel Co. The main office will be at 220 East 42nd Street, New York City.

New developments in electric heating—convection type wall heaters, clothes and towel dryers, plate warmers—are announced by The Prometheus Electric Corporation.

ARCHITECTURAL SIGHTSEEING IN BERLIN

The magazine "Bauwelt," devoted to architecture and building, has arranged a sightseeing tour each Thursday which gives a comprehensive view of modern building art in Berlin. The trip, which lasts from 9 A.M. until 5 P.M., with a pause for luncheon, covers 80 miles in the city and suburbs. It includes the residence sections in the south and southwest, the industrial districts in the east and north, workmen's settlements, modern parks and the elegant villa sections in the western part of the city. Some 500 buildings are shown, and also great groups of apartment houses with central heating plant and laundry for 2,000 to 3,000 apartments. The trips will be continued until winter.

BRACING FARM BUILDINGS

How to take the bulge out of a granary wall or the sag out of a roof, and how to straighten a leaning barn is told in Leaflet 77-L, Bracing Farm Buildings, just issued by the U. S. Department of Agriculture.

The publication is by George W. Trayer, Forest Service engineer and M. C. Betts, architect in the Bureau of Agricultural Engineering. Copies may be obtained free by writing to the Office of Information, U. S. Department of Agriculture, Washington, D. C.

LECTURES AT THE NEW SCHOOL

The New School for Social Research, 66 West 12th Street, New York City, announces an architectural program.

Frank Lloyd Wright, en route to South America to serve as North American representative on the committee of judges in the architectural competition for the Columbus memorial at Rio de Janiero, will stop in New York to hold three lectures at the New School, September 16, 17 and 18. The meetings will be held at 8:30 in the evening.

For the year 1931-32, the architectural workshop will study the problem of reconstruction of the lower East Side, e.g., desirable size of block and height of buildings, open spaces, transit, number and types of schools, types of apartment houses, costs, rentals in relation to income classes. Fifteen to eighteen applicants will be selected to work in groups of three under these members of the committee: Ely Jacques Kahn, Raymond Hood, Wallace K. Harrison, Joseph Urban, Albert Mayer and Ralph Walker.

CALENDAR OF EVENTS

October 1	Closing date for entries for Lincoln Arc Welding Prize competition. Address inquiries to the Lincoln Electric Company, Cleveland, Ohio.
October 9	Joint meeting of the American City Planning Institute with the Regional Planning Committee at Ann Arbor, Michigan.
October 15	Closing date for entries to 5th Annual Small House Competition. Address the House Beautiful, 8 Arlington Street, Boston.
October 20	Closing date for international competition for architectural designs for the Palace of the Soviets, to be built in Moscow. For information address Amtorg Trading Corporation, 261 Fifth Avenue, New York City.
November	Exposition of Indian Tribal Arts, Grand Central Art Galleries.
Until December	Art Exhibition, Royal Society of Painters in Water Colours, London (5a, Pall Mall East).
December 1	Closing date for entries in 1931 Better Homes in America Competition. Address Better Homes in America, 1653 Pennsylvania Ave., Washington, D. C.
Dec. 1-15	The 34th Architectural Exhibition, conducted jointly by The Philadelphia Chapter of The American Institute of Architects and the T-Square Club. The Exhibition will be held in the Architects Building, Philadelphia.
1932	
Jan. 25-29	Second International Heating and Ventilating Exposition, Cleveland. In conjunction with annual meeting of American Society of Heating and Ventilating Engineers.
October	International Congress for Modern Architecture at Moscow, U. S. S. R. Program: "The Functional City."
1933	"A Century of Progress," International Exposition at Chicago.
October	International Congress for Modern Architecture, to be held in Chicago in conjunction with the World's Fair.

THE OCTOBER ISSUE features—

COMMUNITY PLANNING BY ARCHITECTS—a new field of development. Illustrated by the Buhl Foundation model community now being built in Pittsburgh. An article by Charles F. Lewis, economist and director of the project, outlines the procedure in determining the type of housing and site costs. Working drawings of the houses are included.

500 FIFTH AVENUE—a skyscraper office building recently completed at the "world's busiest corner," 42nd Street and Fifth Avenue, New York City. Designed by Shreve, Lamb and Harmon, architects.

A BOSTON APARTMENT HOUSE—in which the lower floors are utilized as the clubrooms of the Junior League of Boston and the upper eight floors as cooperative apartments. Designed by Strickland, Blodget and Law, architects.

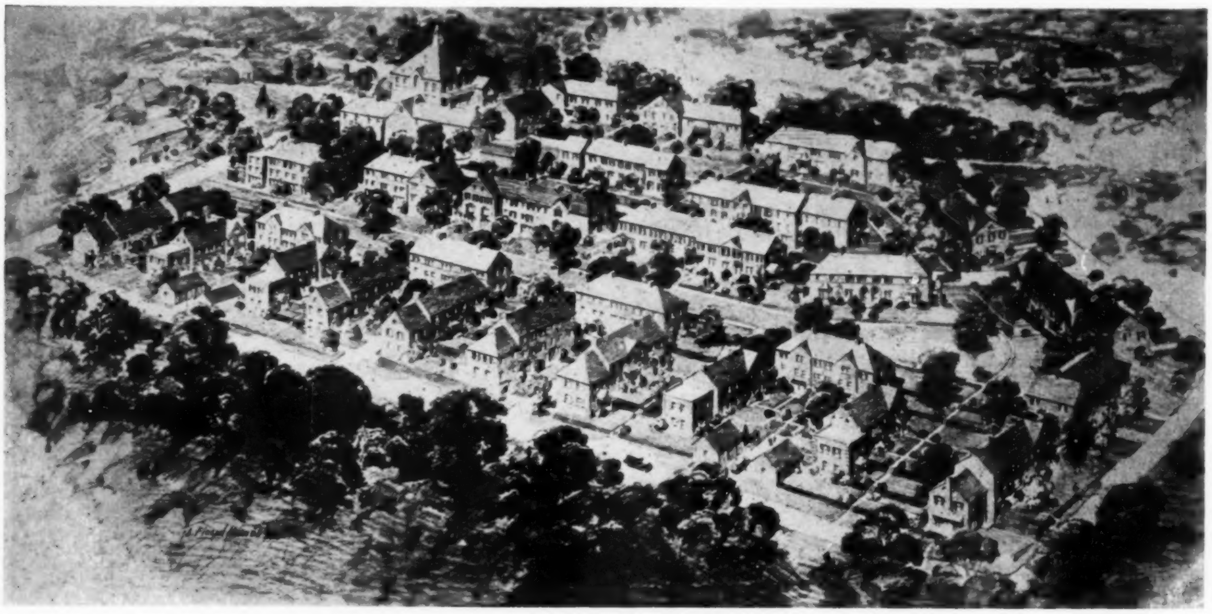
A PORTFOLIO—recent work in Chicago by Holabird and Root, architects.

DIMENSIONS—a study of sizes of basic elements in buildings and their relation to working and living areas. Elevators, theater seats, door openings and other items which the architect and draftsmen need to know in daily practice are conveniently grouped together and analyzed.

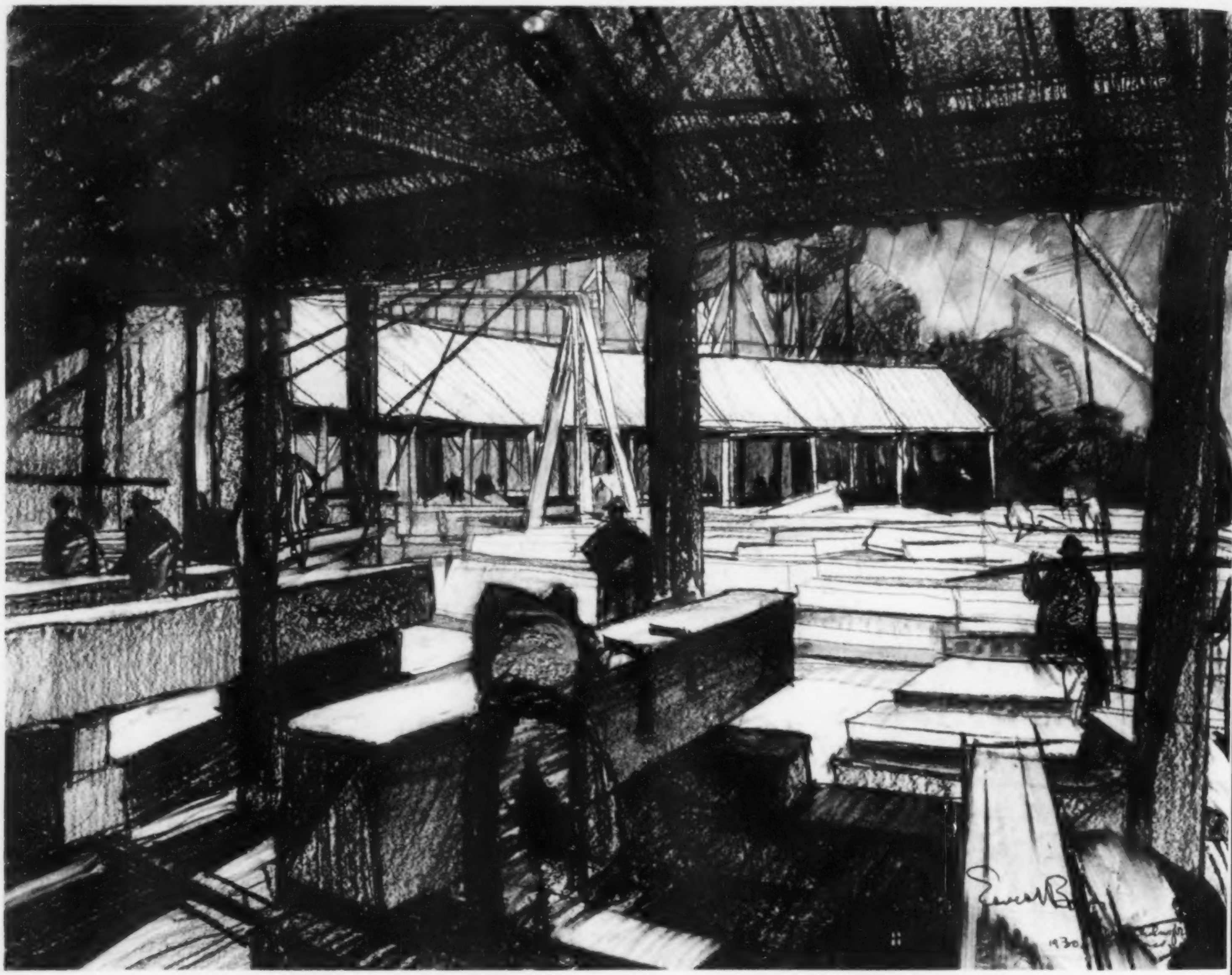
TRENDS IN LIGHTING PRACTICE—a Technical News and Research summary of recent developments in light generation and new methods in light application. Ultra-violet radiation, gaseous-tube lighting, built-in lamp types, control lenses, and dual purpose lighting are discussed.

Weber

APARTMENT HOUSE AND JUNIOR LEAGUE OF BOSTON
STRICKLAND, BLODGET AND LAW, ARCHITECTS

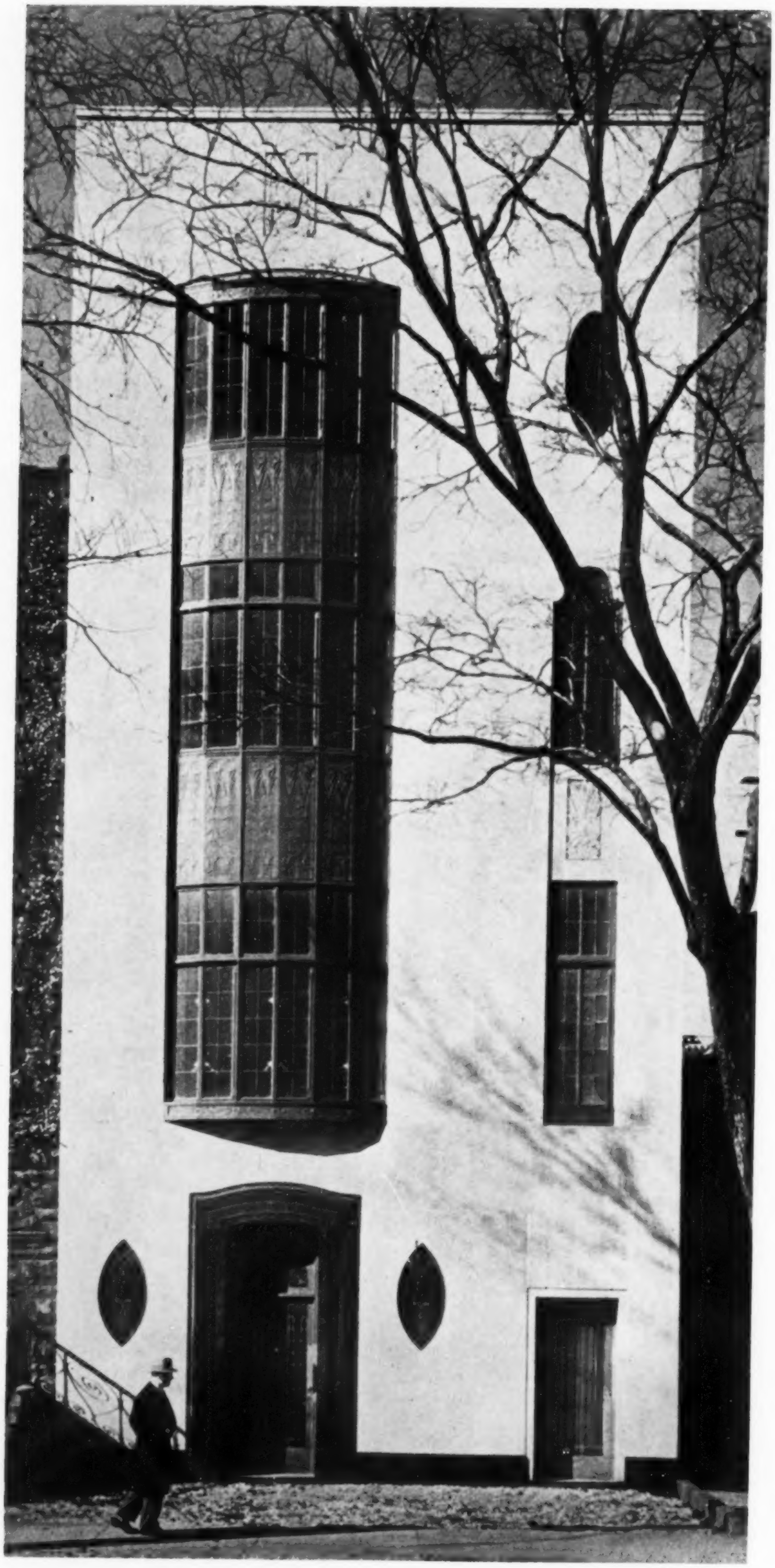


BUHL FOUNDATION COMMUNITY DEVELOPMENT IN PITTSBURGH
INGHAM AND BOYD, ARCHITECTS
CLARENCE S. STEIN AND HENRY WRIGHT, CONSULTANTS
CHARLES F. LEWIS, DIRECTOR OF PROJECT



NUMBER FOUR CUTTING SHED

Number Nine of a series of twelve drawings made at the Fletcher Quarries by Ernest Born.



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ARCHITECTS

THE ARCHITECTURAL RECORD

AN ILLUSTRATED MONTHLY MAGAZINE
OF ARCHITECTURE

VOLUME 70 SEPTEMBER · 1931 NUMBER 3

A PROBLEM OF THE ARCHITECTURAL PROFESSION

By MICHAEL A. MIKKELSEN

The population increase in 1923 was 2,135,000. Since then the annual increase has been smaller each year than the year before. In 1930 it was 1,110,000.

The building industry, including the architectural profession, is geared to care for a ten-year population growth of some 17,000,000—the increase from 1920 to 1930.

P. K. Whelpton of the Scripps Foundation for Research in Population Problems estimates that the 1930 to 1940 population increase may be as low as 9,000,000.

The downward trend in the rate of growth of population is bound to react upon all departments of trade and industry. Upon no other department are its effects likely to be so complex and varied as upon the profession of architecture.

Whether the sum total of these effects proves detrimental or not will depend upon how clearly the profession understands this new major problem in detail.

The ARCHITECTURAL RECORD will therefore analyze the problem as fully as possible in a series of articles, written partly by staff members and partly by outside specialists.

The United States has, and of course always has had, an economic plan or, to use a broader term, a plan of social progress. The plan may not have been set forth systematically under a distinctive title, and it may be incompletely coordinated and integrated. Nevertheless, it exists, being inherent in party platforms, in legislation, in government activities, and in practices and social attitudes of private business.

The objective of the plan is to raise the standard of living, particularly of that part of the population whose standard is subnormal, so that the government need not resort to taxation for certain forms of social relief not in agreement with American tradition—for example, support of the unemployed and housing for subnormal-income groups.

The American Economic Plan

It is proposed to achieve this objective by increasing the total income of the population and by promoting a broader distribution of the income. Among the means adopted or advocated for increasing the total income and promoting its wider distribution may be mentioned:

1. The protective tariff.
2. Graduated income and inheritance taxes.
3. Restriction on foreign immigration.
4. Prohibition.
5. Increased productiveness per man per hour through facilitating technological progress and improved management.
6. Elimination of waste by standardization, by removal of unfair competition and by precision in design (to reduce obsolescence).
7. Reduction of chronic and seasonal unemployment by rationalizing public construction, stabilizing production (for example, in the building industry through winter construction under cover), and by introducing the five-day week of 40 hours.
8. Publication of technical and business information by the government.

An interesting feature of this list is the number of items that do not antedate the war or that have been raised to a new importance since the war. Thus it is only in recent years that capital and organized labor have been able in a large way to unite on the policy of increasing wages (as well as profit) by freely accepting mechanical and managerial labor-saving devices. Similarly, the publications issued or inspired by the government, including such notable examples as Waste in Industry, Business Cycles and Unemployment, Seasonal Operation in the Construction Industries, Civic Aviation, Recent Economic Changes, the Census of Distribution, and so on, disclose a remarkable extension of cooperation by the government with private business to disseminate information related to the economic plan.

Other means adopted or advocated for increasing the national income and promoting its wider distribution might be mentioned, but the list here given is fairly typical of the economic plan in force during the period covered by the census of 1930. The main population trends revealed by the census, and the economic factors explaining their origin, were pointed out in The Record for August.

Population Growth 1930 to 1940

It was seen that restriction on foreign immigration since 1914 has profoundly modified the distribution of age-groups within the population and that this factor, together with other influences affecting the birth rate, foreshadows a marked decline in the rate of growth of population from 1930 to 1940, compared with 1920 to 1930.

The population increase in 1923 was 2,135,000. Since then the annual increase has been smaller each year than the year before. In 1930 it was 1,110,000. The 1931 figure is bound to be lower still, being now estimated at 876,000, because for the first time, so far as yearly records show, more aliens are leaving than are coming in; during the fiscal year ended June 30, 1931, only 97,139 aliens were admitted while 107,376 left.

Mention was made of the very close estimate of the 1920 to 1930 population increase arrived at in 1928 by the Scripps Foundation for Research in Population Problems. A close estimate of the 1930 to 1940 increase can not be expected until the data for age groups, birth and death rates, and so on, from the 1930 census are available to specialists. Meanwhile, P. K. Whelpton, in *Social Changes in 1930*, edited by William F. Ogburn and published by the University of Chicago Press, expresses the conviction: "It is almost certain that the 1930 to 1940 gain will be less than 12,000,000 and quite likely that it will be as low as 9,000,000." The increase from 1920 to 1930 was 17,064,426.

One item of the economic plan, namely, restriction on foreign immigration, has, it is clear, helped to bring about a reduced growth of population. What effect this will have upon the ratio of the gainfully employed or, in other words, upon chronic unemployment is not yet known.

Problem Created by Reduced Population Growth

Evidently a greatly curtailed population growth will be detrimental to the building industry unless it is offset by increased purchasing power, particularly in the lower income groups. The members of the building industry are consumers as well as producers with respect to their own industry and any attempt to force down wages and profits faster than prices decline is a serious error under the existing economic plan.

The fundamental problem created for the building industry by a decreased population growth rate is this: How can the benefits of modern sanitary buildings of all kinds—residential, business, educational, recreational and so on—be shared by a larger section of the population.

The solution may come through a rise in the average income of the population or through a reduction in the cost of owning or renting services rendered by buildings.

It is hardly worth while at present to discuss income trends because the facts available are obsolete. Up-to-date information will presently be supplied by the revised edition of *Recent Economic Changes*, in preparation by a committee of the President's Conference on Unemployment.

The more promising field of study for the building industry is that of reducing the cost of owning or renting building services. This cost includes elements which architects have not heretofore been much concerned with, yet architects are well qualified by experience to take the lead in collaborative studies embracing all elements of cost.

The Record has obtained for publication several examples of such studies, in the hope that they may offer suggestions regarding scope and procedure for inquiries in other communities. Meanwhile, the most extensive investigation of low-cost housing, single and multifamily, undertaken in any country, namely that of the President's Conference on Home Building and Home Ownership, will be described in an early issue.

SHOULD ARCHITECTS UNDERTAKE BUILDING PROGRAMS?

Surveys of housing and building needs, it is believed, could be made in various localities through systematic group effort by architects, realtors, builders, engineers, city planners, health authorities and representative business men.

Such surveys should include these objectives:

(1) Development of a community plan looking to the healthful and attractive future growth of the community.
(2) Study of transportation and traffic problems and requirements.
(3) Investigation of existing buildings to determine obsolescence and possibility of replacement as well as the proper relation of anticipated new space to actual demands for such space.
(4) Study of civic or community building requirements.
(5) Recommendations for health, sanitation and recreation.

The outcome of studies like these would be, presumably, a recommended building program, related to conditions of local finance and the incomes of workers in various classes.

Should such building programs be initiated by architects and architectural associations in communities where housing and building needs are found?

"NOT THE HOUSE BUT HOUSING IS THE OPPORTUNITY OF THE ARCHITECT"

It seems to me highly important that the architect should now interest himself more than ever before in home building. I do not mean that it is important that at this moment an architect should try to get somebody to let him design and build a house for him. I mean that the last few years have seen the development of new possibilities for architects in the matter of housing. For a long time the isolated house designed for an individual owner solely was considered by the architect to be his field. But today it is not the house but housing which is the opportunity of the architect.

There were significant indications in 1930 that a change had come about in the point of view of the so-called "developer." Thomas Holden told us that the best of these men realized that we had come to the end of cutting up pieces of land into small lots and selling those lots to individuals. Some of these subdividers expressed the opinion that what the public now demanded was a completed project, a house in a neighborhood. There were apparently too many risks involved under the old scheme. You could hardly keep your neighbor from building a house out of purple stucco with pink blinds. If the real estate men now realize that they have to produce a finished neighborhood of houses in order to dispose of any one of them, then we have a condition which the architect has been praying for for generations; at least the architect who knows anything about community planning. If you are designing a house for a two-acre plot you may not be so affected by what the man does on the adjoining two acres. Architectural control and restrictions may be sufficient. But in the suburbs and in congested areas, the curse of all community growth has been the sale of lots as such, leaving the design of adjoining houses to the taste of individual owners.

It is my opinion that right now the architects of the country are faced with a wonderful opportunity. I can imagine nothing that would help more in the present economic depression than to start up a home-building campaign, but I should deplore having that scheme started on the old basis. The architects in every single community ought to study the needs and the possibilities of their surrounding country. In co-operation with real estate men and contractors of ability they could work out schemes of group housing on such a scale as would make it possible to offer the individual purchaser a completed house in a neighborhood that is settled, and moreover one that is properly related to surrounding communities. I believe that there are hundreds of places in this country where such schemes of group planning could find support and financing from groups of interested citizens at a time like this when costs are low.

The architects of the country can do the job if they tackle it with their usual intelligence. For a large majority of people, the designing and the construction of an individual house is an impossibility. Moreover, even if they could do it, it is not even desirable that they should. For all of these citizens we ought to provide a home which is part of a group scheme. The opportunity is ours to study these larger housing scheme.

ROBERT D. KOHN, *President*
The American Institute of Architects

EUROPEAN HOUSING PROJECTS WORTHY OF STUDY

It would be splendid if the architectural profession could place itself in the vanguard of an effective, socially-minded group determined upon the rehabilitation of our cities.

I believe that there are some seven hundred City Plan Commissions already in existence, but from my limited observation, I am inclined to be somewhat pessimistic about their accomplishments. How soon we shall be able to reform the present hit-and-miss, catch-as-catch-can development of our cities no one can say. However, what is seemingly impossible may sometimes unravel itself more quickly than any of us may anticipate.

When one considers the superb housing developments in Europe since the war, one cannot help but be abashed at the backwardness of America. True, many of these enterprises have been made possible by money loaned by us which may never be returned. The social and aesthetic accomplishment, however, is nevertheless inspiring.

My own city is unkempt and ragged; filled with antiquated, ramshackle buildings which, if they do not breed disease and crime, at least breed inertia, indifference, and hopelessness.

At the moment the speculative builder seems to be about through, but he will come back again at the first opportunity. Just how to interest new capital in any building enterprise is a problem which I am unable to solve, but we all know that the country is full of idle money seeking outlets for investment.

The Chapters might interest themselves in studying certain phases of the housing development for instance, and by this I do not mean low-priced individual houses, but well designed, sanitary blocks of houses like the German, Dutch, and Austrian developments.

Louis La Beaume
La Beaume and Klein, Architects
St. Louis

BUILDING CONDITIONS IN DETROIT

To get an authoritative survey would involve a lot of real, honest effort—too much to ask a Chapter member or members to give without recompense, and funds are always short. Detroit has foolishly given away *millions* in its welfare department, to the unemployed, and *no* city building can be done here for the next decade. The future has already been mortgaged.

We are overbuilt in every way except low-cost housing—no survey is needed to learn *that.*

Lancelot Sukert, *Architect*
Detroit

OPPORTUNITIES IN SMALLER TOWNS

It seems to me that particularly in smaller towns throughout the country, the formation of committees of architects attempting to work out uses and developments for different sections might be a very constructive move. In larger cities it would, of course, mean getting into the problem of zoning, which is probably too big to be tackled by any committee.

In Los Angeles the extension of the commercial district is going on so rapidly that while we have the suburban districts pretty well zoned, none of them lasts very long and any zoning ordinance that is passed must be very flexible indeed. In older and less rapidly growing communities I think members of the profession might do some good work.

David C. Allison
Allison and Allison, Architects
Los Angeles

SURVEYS ALREADY BEGUN IN PHILADELPHIA

Here in Philadelphia we have a Commission on Regional Planning and another on Zoning which have been at work for the last three years and no doubt their reports, especially that of the Regional Planning Commission, will have much of interest and value.

In addition to these two agencies we have the newly formed Philadelphia Federation of the Construction Industry. The Philadelphia Chapter of the Institute is very much interested in this organization and very helpful results we hope are to be obtained. The membership of the organization is composed of architects, bankers, bonding companies, engineers, general contractors, insurance men, real estate operators, and so on. An important and significant part of the Federation's program is the development and operation of the Research Department. Its activities will include objective studies of building projects for the purpose of determining the soundness of the financial plan, and the like, as well as analytical studies of existing buildings. Collection and publication of authentic information for bankers and builders will enable them to anticipate the extent and location of the demand for various types of houses, and also the stabilization of the realtor's business by fostering the development of an intelligent control of apartment, hotel, office building and residential construction.

Anything that can be done to stimulate building in these parlous times is worth trying.

E. Perot Bissell
Bissell and Sinkler, Architects
Philadelphia

MEMPHIS BUILDING CONGRESS STUDIES CONDITIONS

The appointment of committees of the Memphis Building Congress, of which I am President, has been recently completed; among others I appointed a committee to make a study of building conditions in this city.

On this committee I placed a representative of each of the following groups: Manufacturer, Builder, Architect, Engineer, Realtor. As the Building Congress is composed of representatives of all the elements of the industry, I believe it is the best agency to undertake this task.

Needless to say, there are a great many other matters, which an organization like the Congress can handle better than any single group, and yet I know of no committee which I have appointed that is more important, certainly at the present time, nor one that will have more work to do in order to accomplish anything, or to justify the existence of the Congress.

The very nature of the Congress, combining in one organization the architects, builders, realtors, manufacturers, financiers and labor, makes it possible to function as no other single group could, and besides places us in a position to obtain the information and services essential to a thorough study of any problem.

M. H. Furbringer, *Director*
The American Institute of Architects
Gulf States Division
Memphis, Tennessee

"SOUND BASIC PLANNING" IS NEEDED

A "survey" to determine the architectural needs of communities is certainly reasonable enough. One was undertaken by the Boston Chapter thirty or more years ago. The report was published, a bound volume of two hundred pages or so, including many illustrations, and created a mild interest. It was soon forgotten and nothing resulted.

I would rather pin my faith on City, Town and County planning boards. They lay out new streets, and that means tearing down old buildings, also some not so old, and new building *must* be built to replace them.

What this country needs, besides a good 5-cent cigar, is sound basic planning. If communities are started right, or re-planned skillfully, locations for new structures are provided and architects will have plenty of jobs.

Hubert G. Ripley
Ripley and Le Boutillier, Architects
Boston

DETROIT BUILDING CONGRESS WILL MAKE A SURVEY

Properly carried out a building program would help to create a better attitude by the public toward the profession. Although the program should stimulate the building industry the architect is not placed in the position of seeking work primarily, but rather in offering useful and constructive data looking toward the future prosperity and health of the community.

The Detroit Building Congress is in the process of organization. Many of us have high hopes for the possibilities for good which may be accomplished. The Congress will be composed of about sixty organizations, including architects, realtors, contractors, bankers, material men, and so on. Although only partially organized it is already functioning and among the tasks it has assigned itself is an analytical survey of the metropolitan area.

This particular phase seems worthy of emphasis. It is a common problem for nearly all cities—the reconstruction of areas which have lost their original usefulness and hence their value as sources of income.

Many believe that capital could well be invested in these now hopeless districts developing new, moderate-priced, practical and healthful housing developments other than the regular tenement or apartment type of structure. Generally, these districts, being easy of access, would make very desirable locations for a certain type of residential occupancy. There are hundreds of instances where this kind of improvement has been made but those properly executed are still the exception.

At one of our recent Chapter meetings we enjoyed a very profitable evening listening to Prof. Ernest M. Fisher of the University of Michigan who illustrated his address with slides showing examples of housing developments in England, France, Germany and Vienna, which he had visited on his tour to study the solutions of post-war housing shortage in those countries. There is an evident interest in this problem but business inertia prevents progress at present.

Arthur K. Hyde
Stratton and Hyde, Architects
Detroit

SURVEYS BY CITY COMMISSIONS?

As surveys of the larger cities, if they mean anything at all, would be rather gigantic undertakings, it is a question as to how much value they would be unless carried on under commissions appointed by the city fathers.

W. J. Smith
Childs and Smith, Architects
Chicago

Kammerdiener

TYPICAL SMALL HOUSES BUILT FROM STOCK PLANS
PROVIDED THROUGH THE COOPERATIVE EFFORT OF ARCHITECTS

THE ARCHITECTS' SMALL HOUSE SERVICE BUREAU

PHILADELPHIA ARCHITECTS PREPARE A BUILDING PROGRAM

Architects and others have taken the initiative, through the Philadelphia Federation of the Building Industry, in promoting activities directed toward improving building conditions.

These activities include research in the economics of building and the gathering of facts which will bring forth better construction, sound financing and stabilization of the industry. New and existing buildings will be analyzed as to rates of return. By proper control it is believed that overproduction of buildings can be avoided and a need for building for specific use and location can be determined.

An intelligent control of construction projects, which will make possible the sound financing of buildings and minimize the evils of over-production and a disorganized realty market, is being planned for Philadelphia. The initiative has been taken by architects and other groups interested in construction to promote a definite program of studies and activities directed toward mutual cooperation. The medium, now in process of organization, is the Philadelphia Federation of the Construction Industry.

By foresighted planning and leadership and the correction of unsound practices, the Federation aims not only to hasten the return of a business revival but also to assure the well-being of the community.

The Philadelphia Chapter of the American Institute of Architects is one of twenty-two groups in the construction industry actively participating in this movement, according to Edward P. Simon, architect and chairman of the executive committee. All associations, individuals or corporations concerned with building or its product are recognized as part of the major activity. These groups include:

Architecture	Insurance
Banking	Materials and Equipment
Bonding Companies	Operative Builders
Building Owners and Managers	Public Utilities
	Real Estate
Engineering	Public Works Contracting
General Contracting	Subcontracting

Cooperation

The movement began in the councils of the Philadelphia Building Congress just one year ago and is expected to be functioning as the Federation before September, according to Mr. Simon, who writes to The Record as this issue goes to press.

It was shown that more than forty trade associations in Philadelphia have been spending more than $300,000 each year in attempts to remedy conditions and practices harmful to the industry. The effectiveness of this work has been limited, and even nullified, by the inability of these groups to influence the activities of others. Bankers, architects, builders, realtors, as well as the trade associations, have been aware of a common interest in construction activities, but no facilities existed for uniting to consider problems of vital interest to all.

The Federation fulfills this need. Two constructive features are placed at the disposal of members:

1. A central agency through which mutual problems may be presented to representatives of all branches of the industry for solution and remedy.
2. A union of bankers, realtors, surety writers, and architects with construction groups and allied interests in a concerted effort to stabilize not only the construction industry but also real estate investments.

Objectives

The aims of the Federation are economic in character. As set forth in the charter application, they are:

To protect and promote generally the various interests of individuals, firms and corporations in the construction industry.

To provide a clearing house of information for all phases of the industry.

To improve the ethical standards which govern the relations of different groups and trades within the industry.

To promote sound credit standards and practices.

To encourage the settlement of trade disputes of all kinds by commercial arbitration.

Program of Activities

During the current year these objectives will be approached by a program of activities, which has

already been set up. This program includes the following activities.

Credit Bureau

The general function of this bureau will be to improve credit standards by collecting and disseminating credit information and by developing standard practices in the granting of credit.

Research

This department will provide an authoritative source of information for those members concerned with basic rather than immediate trade problems. Among its activities will be:

Objective studies of building projects to determine the soundness of the financial plan and the rate of return, as well as analytical studies of existing buildings with a view to increasing their present rate of return.

Collection and publication of authentic information relating to the demand for various types of houses at any given time, thus making possible a sound financial control of residential projects and minimizing the evils of over-production.

The development of an intelligent control of apartment, hotel, office building, loft building and residential construction, thus avoiding the erection of superfluous buildings leading to excessive space and a disorganized realty market.

The development of a sound real estate tax program to insure equitable assessments.

Engineering

The construction groups primarily will be served by this department. General activities will include promotion of standard contracts and specifications, accident prevention, improvement of bidding practice, apprenticeship training, cost accounting, current revision of the building code, and the maintenance of a plan room. Various types and grades of materials used in construction will be given economic appraisement. Expert advice concerning the economies of public utility services involved in various building projects will be available.

Quantity Survey Bureau

The operation of this bureau will reduce indiscriminate bidding and check unfair competition.

Information Bureau

As a clearing house of facts, this bureau is designed to meet the needs of the architectural and engineering professions. It will be international in scope. Definite information concerning all types and varieties of materials and equipment used in construction, much of which today must be gathered from many sources, will be available in one place.

Arbitration Board

The Constitution of the Federation provides that this board shall consist of not less than eleven members, with at least one representative each from the following divisions of the industry: architecture, banking, bonding companies, engineering, general contracting, insurance, materials and equipment, public utilities, public works contracting, real estate, and subcontracting. The board will function actively in the settlement of various kinds of trade disputes, especially in the field of credits, between architect and builder, general contractor and subcontractor, and material and equipment dealer and construction units.

Law and Legislation

Wherever municipal or state legislative action is necessary, the best judgment of the leaders in the building industry will be canvassed, resolved into an articulate program, and sponsored before the executive or legislative body concerned.

Public Relations and Publicity

The public which is served by the building industry must be educated to an understanding of its function in the community. By the judicious use of advertising and the systematic dissemination of accurate information, the Philadelphia Federation will be cultivating an intelligent building mind as well as aiding materially in developing an appreciation of the facilities and resources which the Philadelphia industry has for community service.

Palmer Shannon

THE ARCHITECT AND THE SMALL HOUSE

By WILLIAM STANLEY PARKER, Architect

How can the builders of small houses be reached? Through organized cooperative effort by architects and loaning agencies, material dealers and real estate interests.

How can they be served on a basis that they and the architect can afford? By stock plans prepared by architects, plus supervision.

The field of the small house is of vital importance to our small home owners, to the communities they create, and to the architectural profession.

Investigations indicate that in our American communities from 75% to 98% of the small houses are built for sale to some hoped-for purchaser. The architect must therefore seek to reach and serve the speculative builder if he is to take a controlling position in this field and secure the remuneration resulting from the application of his services, in either design or supervision or both, to such houses.

It is clear that if the architects sit down and hope for the small house owner to come to them for their service, they will be thinking in terms of from 2% to 25% of the market. How, then, can they reach the 75% to 98% of the market on any basis of reasonable professional service?

It is clear that their ability is needed in one of the most exacting fields of architectural design. It is increasingly clear that intelligent large scale operative builders always employ an architect. How about the others who build only a few houses, perhaps only one or two, at a time? How can they be reached? How can they be served on a basis that both they and the architect can afford? The correct answers to those two questions can put the architects in a controlling position in perhaps the largest

single field of the building industry. Let us consider, therefore, these two queries, in order.

How can they be reached? I believe the answer can only be found through organized cooperative effort.

The architects in each locality, through group action which could be initiated by Institute Chapters wherever they exist, should bring pressure to bear first upon the local loaning agencies in an effort to make them see the importance of developing some reasonable minimum standards for design and requirements for supervision to apply to all houses on which construction loans or later mortgage loans are made. This action is important to the loaning agency in protecting its loan, to the home owner in protecting his equity, to the community in protecting the interests of adjacent property and general community values. These agencies are now in a receptive mood but need further conviction, and also help, in developing a practicable system by which to provide the technical service needed.

The architects should make direct contact with the material dealers of their community and seek to show them the desirability of protecting the reputation of their materials by the quality of the houses in which they are used. Also to prove to them their share of responsibility for the production of decent housing for the community, and the various elements of technical service needed in both design and supervision.

They should seek the support of the real estate interests in a program of decent construction and design, and reach directly, so far as possible, the operative builders, a relatively small number of whom will probably be found to be providing the majority of such housing in the community.

The speculative operative builder is as a rule an unorganized individualist and difficult to reach directly, but he cannot function without money. He can be reached, and in large degree controlled, if the loaning agencies can be shown the need and their cooperation secured for the development of controlling standards below which loans will not be made. And if the material dealers can be won to give their cooperation, through them can also be reached and influenced the lower ranks of the speculative builders who are now too frequently being led astray by bad advice received from the material dealer.

These are the three principal groups outside the profession engaged in producing the small houses of our communities. Leaders in each of them are awake to the errors of the past; they are ready for a leadership that is technically trained and which only the architects are in a position to provide. Through these groups then the architects can and must reach the builders of houses for sale if they are to put themselves in a position where the answer to the second question is required.

How can they be served on a basis that they and the architect can afford? On the same basis that the profession has for years served them whenever it was lucky enough to get that sort of a commission. On the same basis that small houses were conceived and built for the Government housing projects during the war. On the same basis that houses were designed and supervised for Radburn or any of the other intelligently managed large scale operations. By stock plans—thus reducing the cost of the factor of design for each house to a more or less nominal price. Plus supervision—on a basis gauged to fit the economic needs of the particular operation involved.

For years we have incorporated in our drawings and specifications stock details, stock sash, stock doors, stock mantels, stock fittings, according to the requirements of our clients' problem. We have also, whenever a large housing development gave us the opportunity, developed stock plans, subject to variations in minor details, and sufficiently varied in basic plan to fit the varying needs of differing lots and families.

As a result of these stock plans, the purchaser of one of these houses from such a large operative builder secured high grade technical service in the designing of his house at a relatively nominal cost. But as yet the average architect has refused to accept the duty of providing similarly economical professional service for the individual owner or builder who seeks to build only one or perhaps two or three houses instead of fifty or a hundred.

Why should an individual with the courage and initiative to build his own house, of the same general size and cost as those built by the speculative builder, be discriminated against and told he must pay a full architect's commission, while the purchaser of a house built by the large operator gets architectural service at a reduced rate? The only reason is that the architects have failed to grasp the fact that it was both their duty and their opportunity to develop their own instruments of service, in the shape of basic stock plans, so that they would be in a position to serve such clients on a similar economic basis. They have turned up their professional noses at the idea of a stock plan for a known family while instinctively accepting the quite necessary idea of a stock plan for an unknown family. The unknown family was analyzed, its general type, size and requirements determined, based upon certain assumptions of social and economic status, and a series of houses suitable to such families designed, built and later moved into by families of the type assumed.

Why should not each architect, who desires to serve this small house field, make such basic assumptions in regard to the small house owners of his own community and devise basic house designs suitable to their needs and capable of varying details both

inside and out, and varying major structural materials according to the legitimate needs of each case. This work could be done when the architect is not busy on other work and so make productive hours that would be otherwise idle. Having done this, he would be in a position to make such designs available for use by a client at a small unit cost, and gain the client's gratitude and probably the added job of supervision.

Design and supervision are the two broad classifications of service. The first is subject to economies through standardization, the second is entirely and necessarily special service. But in my opinion the latter is more important to the owner than complete individuality of design. If he can economize in the cost of design, through use of some standardized plans, he can well afford to buy full supervisory service. And the architect's remuneration for this service will be wholly a gain.

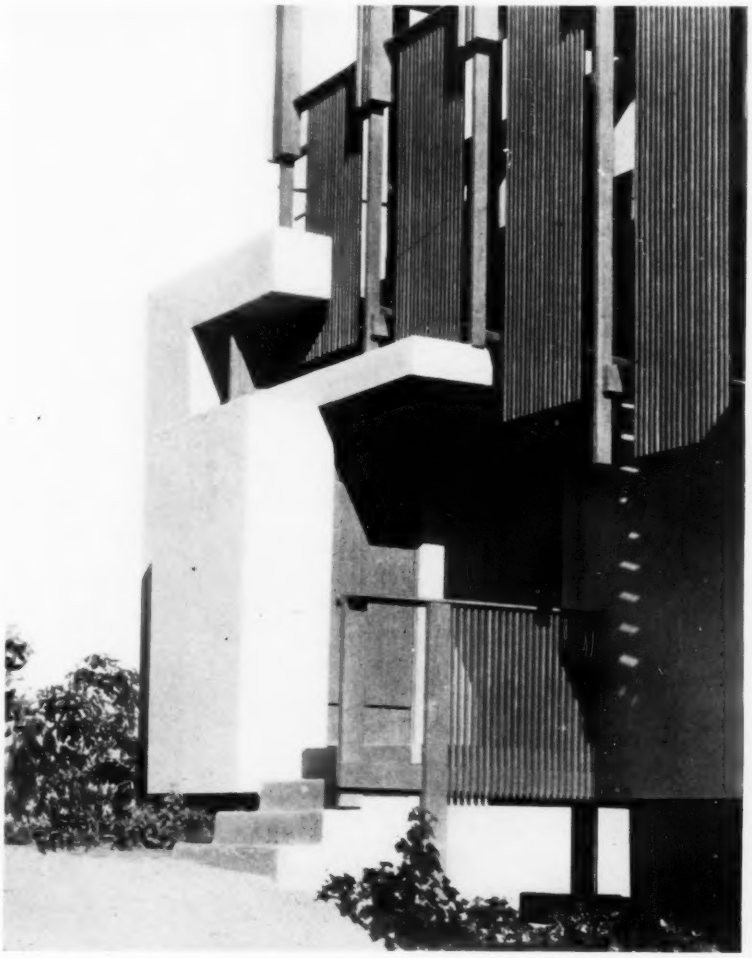
Some architects have realized their failure to provide within their own offices the stock plans required to serve such clients properly and when such a client came to them have helped him to secure such a stock design through the Architects' Small House Service Bureau, devised to provide such instruments of service through the cooperative effort of a group of architects. Having thus secured the plans the architect was in a position to serve the client further for supervision as the owner might desire. It makes no difference in principle whether the stock designs are made available by the individual architect for himself or by a group of architects for any one's use. The basic economy is secured which should be provided for such clients, and the architect is in a position to use such designs effectively for the clients' full service.

The architect, if he would develop his usefulness, and therefore his business in this field, must solve the underlying economic problem of these potential clients in relation to his service. When he does this there is every reason to believe that he will win out against his technically untrained competitors.

SUMMER HOUSE

OF C. H. WOLFE
CATALINA ISLAND

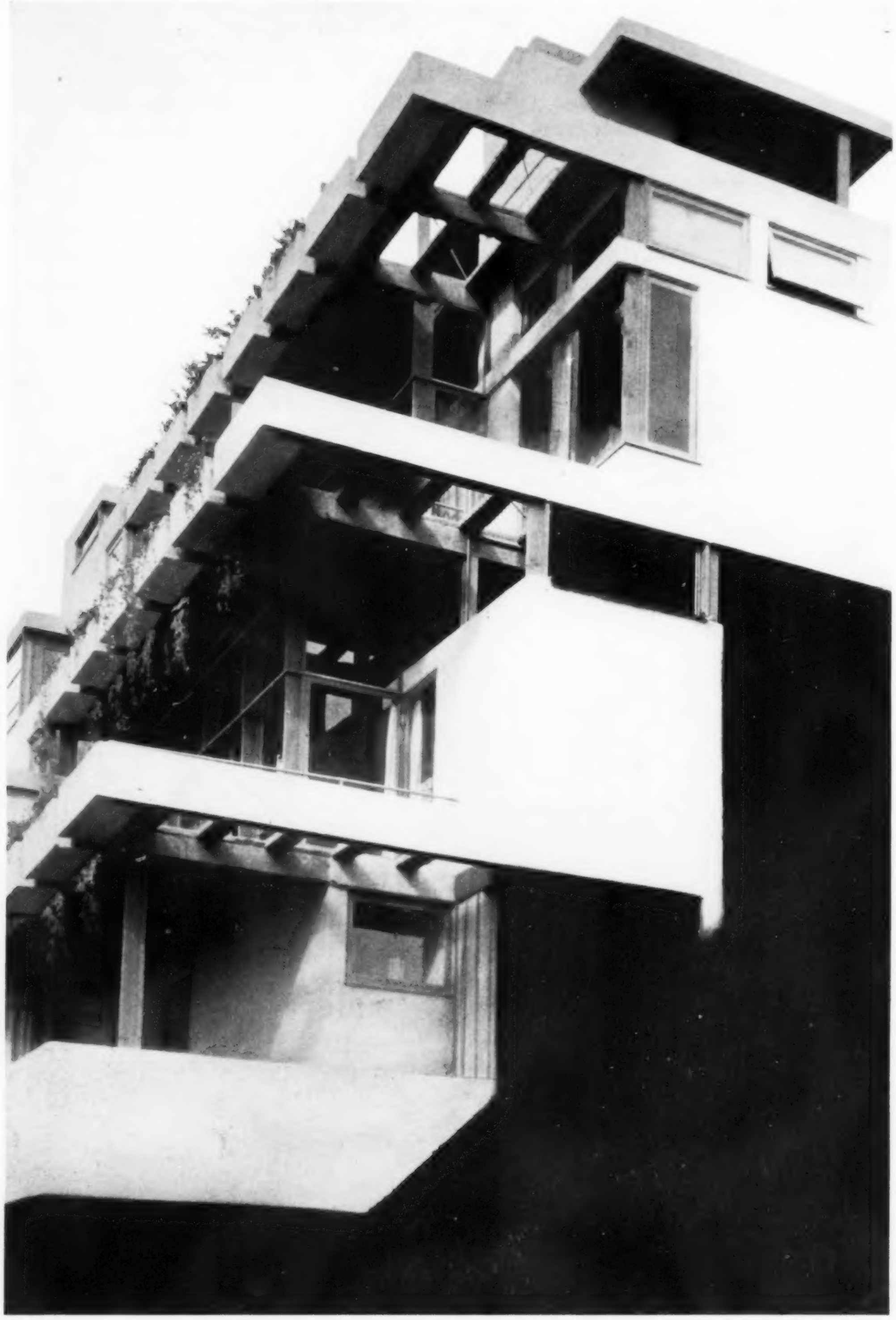
R. M. SCHINDLER
ARCHITECT



The house is on a small plot, 30 by 40 feet, on a steep hill overlooking the Bay of Avalon and the Pacific Ocean. It is used only on week-ends and during the summer.

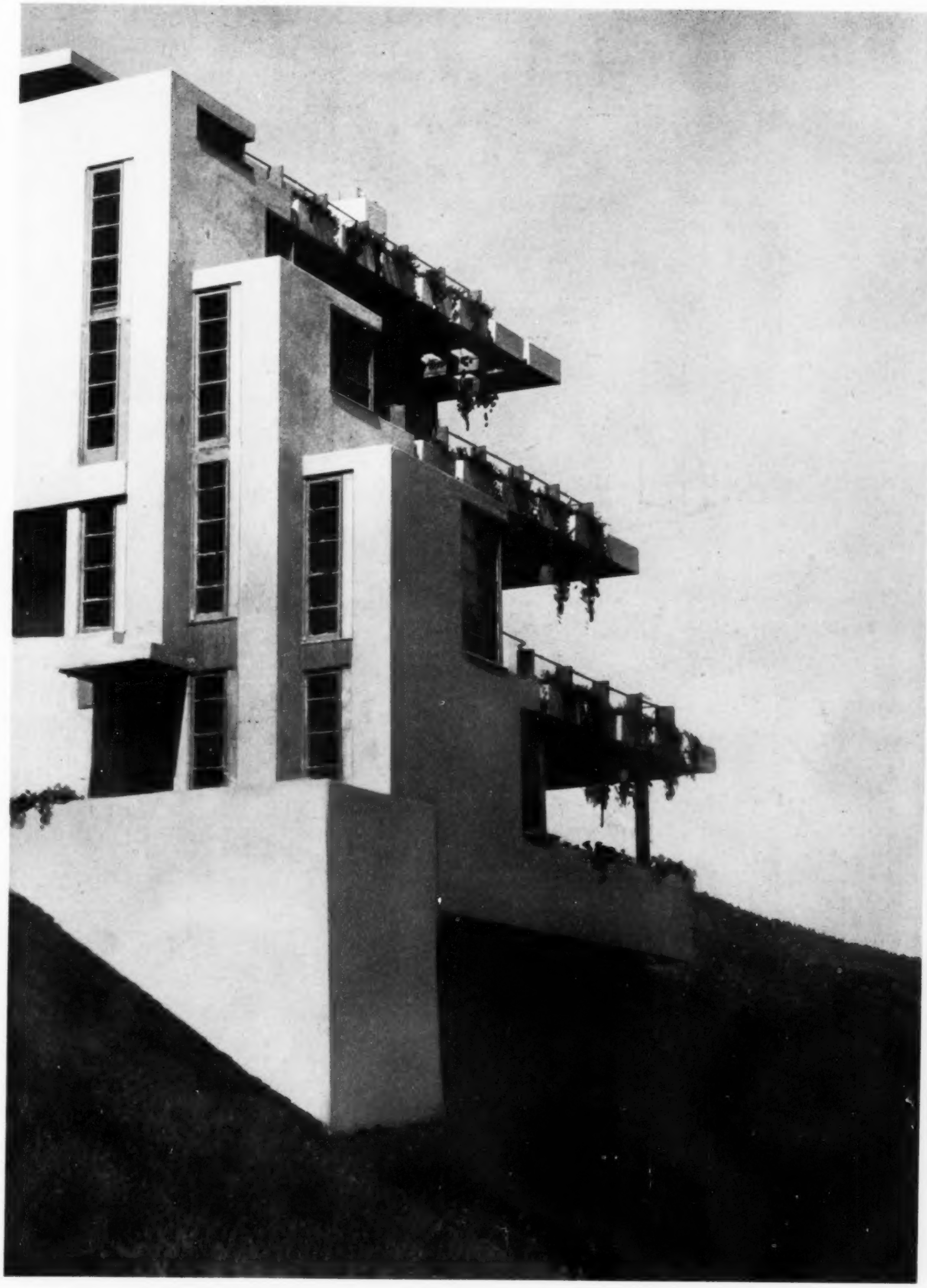
Living quarters are on the upper floors. Each floor, including the roof, has a sunny garden terrace.

Construction: wood frame with stucco finish. Floors and terraces of 2″ reinforced concrete slabs supported by exposed wood joists 4 feet on centers. Ceilings of corrugated iron sheets which also serve as forms for the concrete. Sheets are finished in gold bronze.



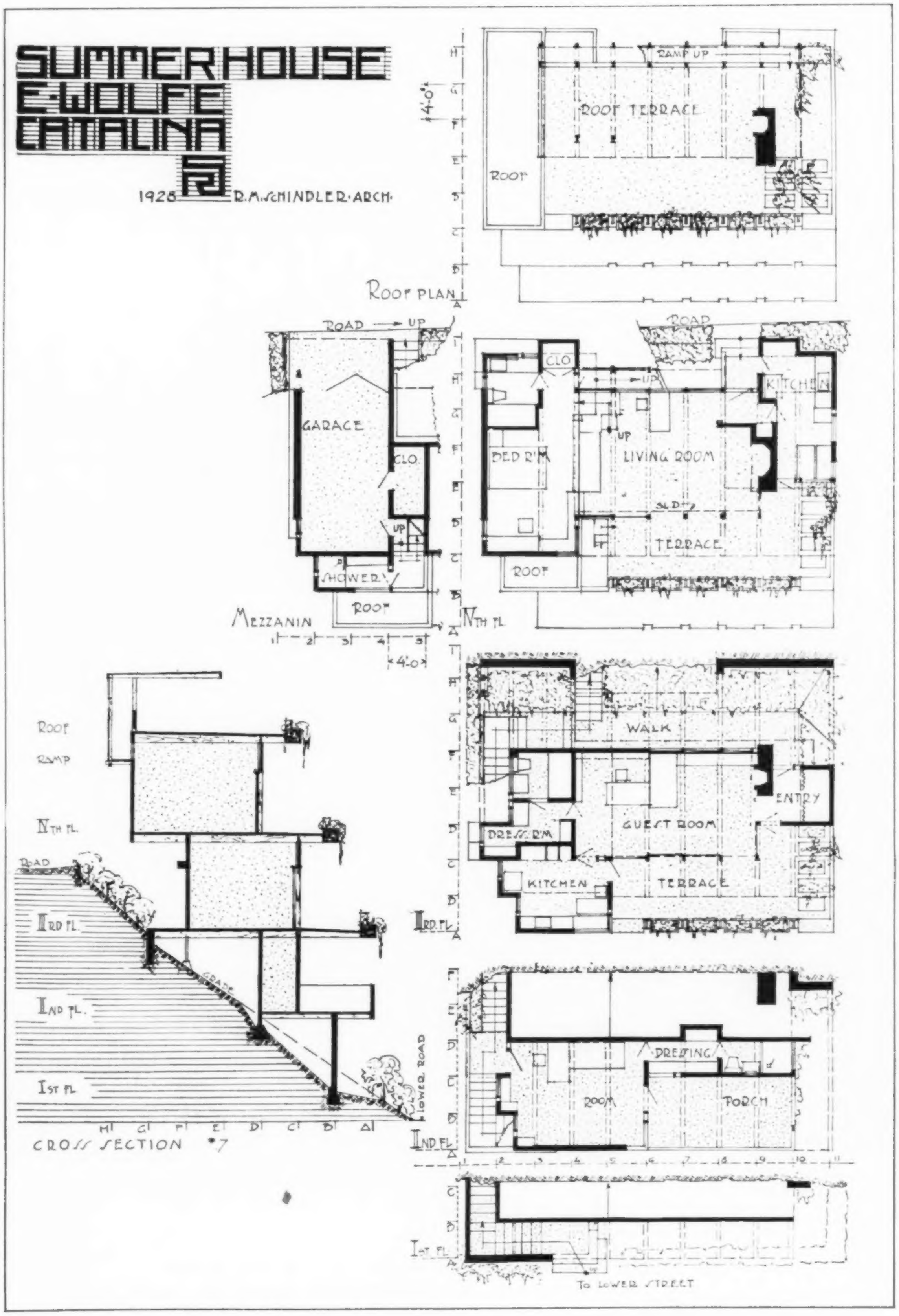
PORCH TERRACES

SUMMER HOUSE OF C. H. WOLFE ON CATALINA ISLAND
R. M. SCHINDLER, ARCHITECT



VIEW TOWARDS OCEAN

SUMMER HOUSE OF C. H. WOLFE ON CATALINA ISLAND
R. M. SCHINDLER, ARCHITECT


SUMMERHOUSE
E·WOLFE
CATALINA
1928
R.M.SCHINDLER·ARCH·
ROOF TERRACE
RAMP UP
ROOF
ROOF PLAN
ROAD
UP
GARAGE
CLO.
SHOWER
ROOF
MEZZANIN
CLO
KITCHEN
BED R'M
LIVING ROOM
TERRACE
ROOF
Nth FL.
ROOF
RAMP
Nth FL.
ROAD
IIIrd FL.
IInd FL.
Ist FL.
GRADE
LOWER ROAD
CROSS SECTION #7
WALK
ENTRY
GUEST ROOM
DRESS R'M
KITCHEN
TERRACE
IIIrd FL.
DRESSING
ROOM
PORCH
IInd FL.
Ist FL.
TO LOWER STREET

DRESSING TABLE

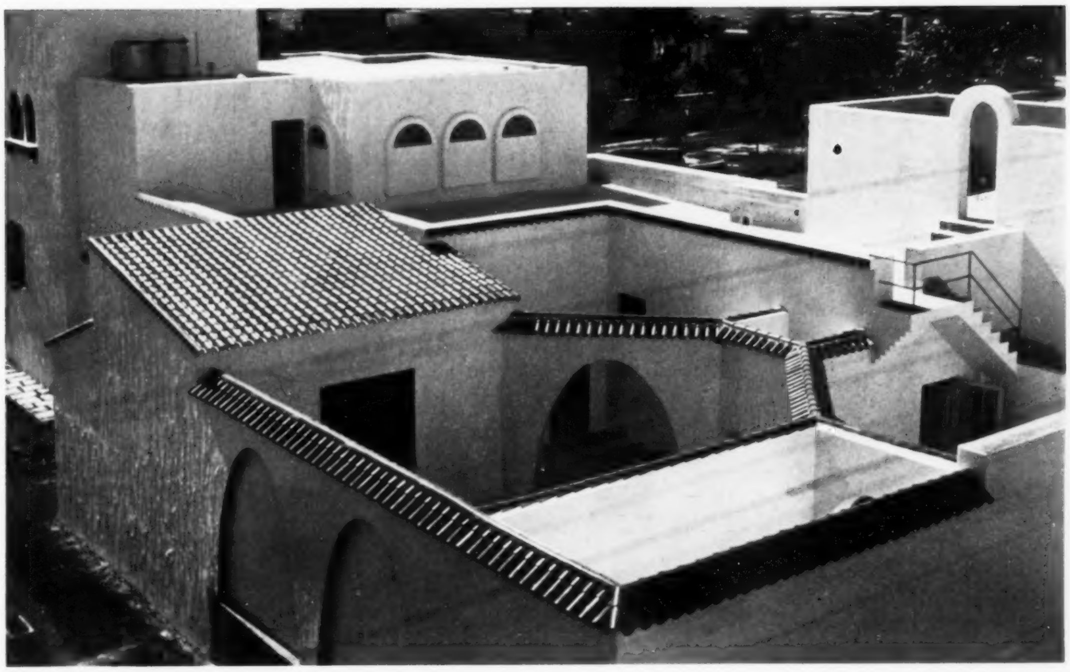
SUMMER HOUSE OF C. H. WOLFE ON CATALINA ISLAND
R. M. SCHINDLER, ARCHITECT

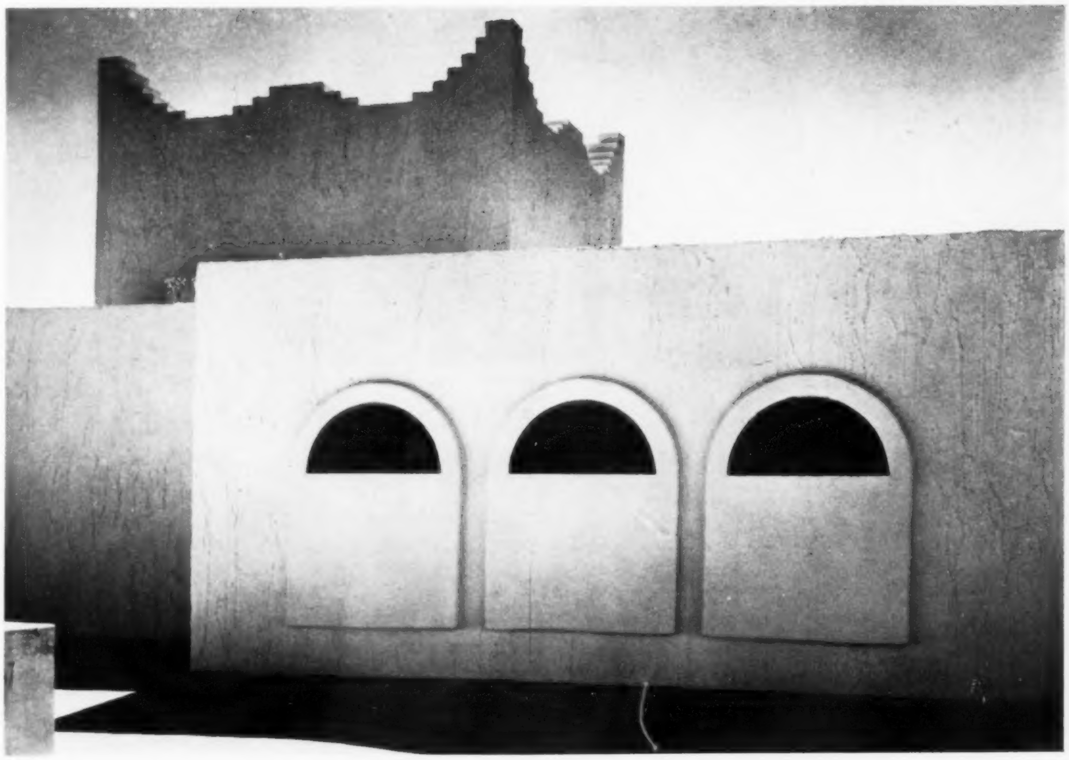
MEXICAN VILLAS

LUIS BARRAGAN, Architect

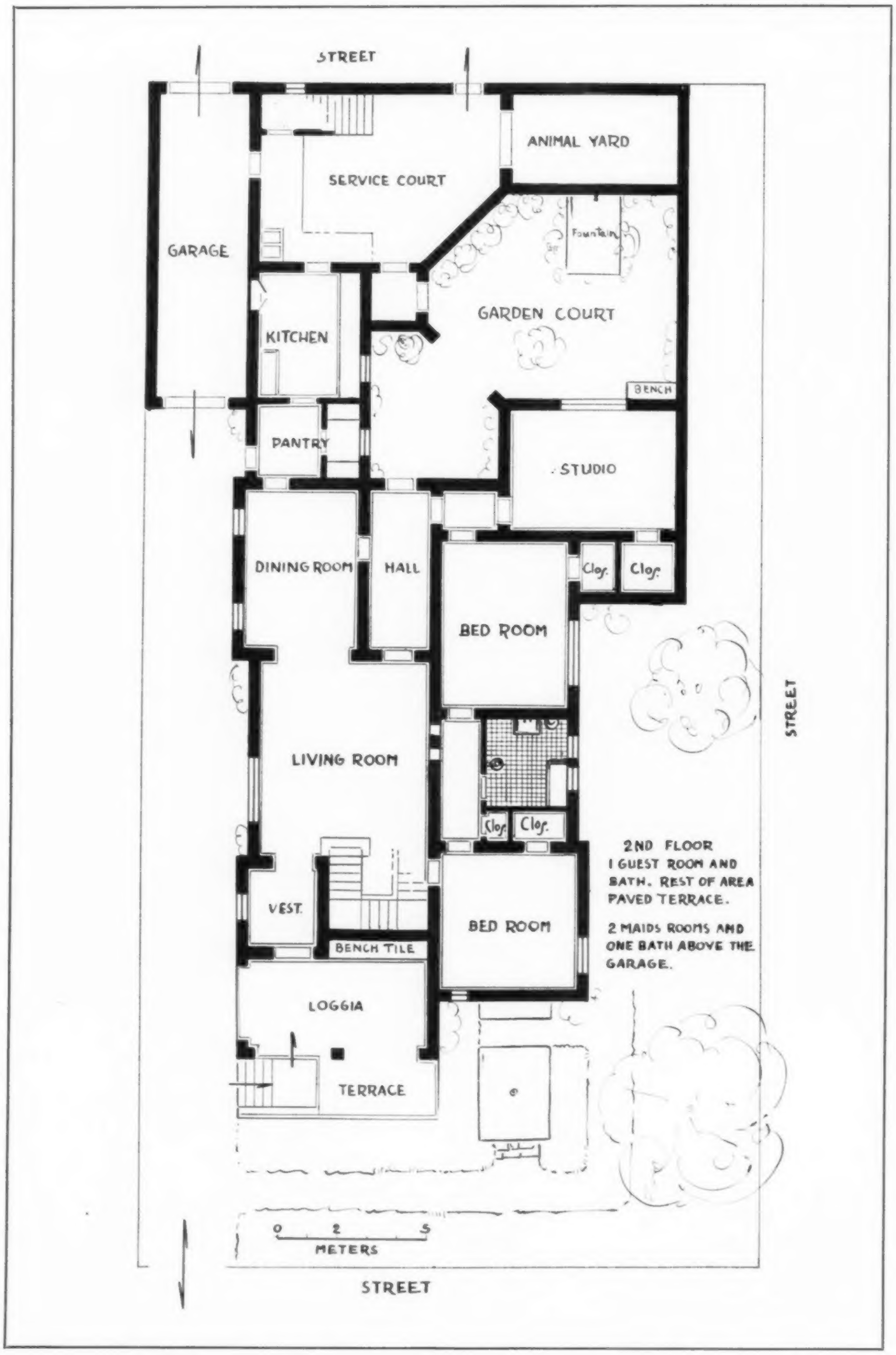
In Luadacazara, Mexico, at an elevation of 11,000 feet, the climate is not hot. Because of strong daylight, windows are small. Outside walls are blank. Rooms open on garden courts which are made intimate for the daily life of the family.

Construction is adobe faced with lime and yellow sand. Roofs are of red tile. The houses cost approximately $10,000.





VILLA OF G. R. CRISTO, LUADACAZARA, MEXICO
LUIS BARRAGAN, ARCHITECT



VILLA OF G. R. CRISTO, LUADALAZARA, MEXICO
LUIS BARRAGAN, ARCHITECT

A PORTFOLIO OF CHURCH ARCHITECTURE

WILSON EYRE AND McILVAINE, ARCHITECTS

MISSION CHURCH OF ST. GILES, STONEHURST, PHILADELPHIA

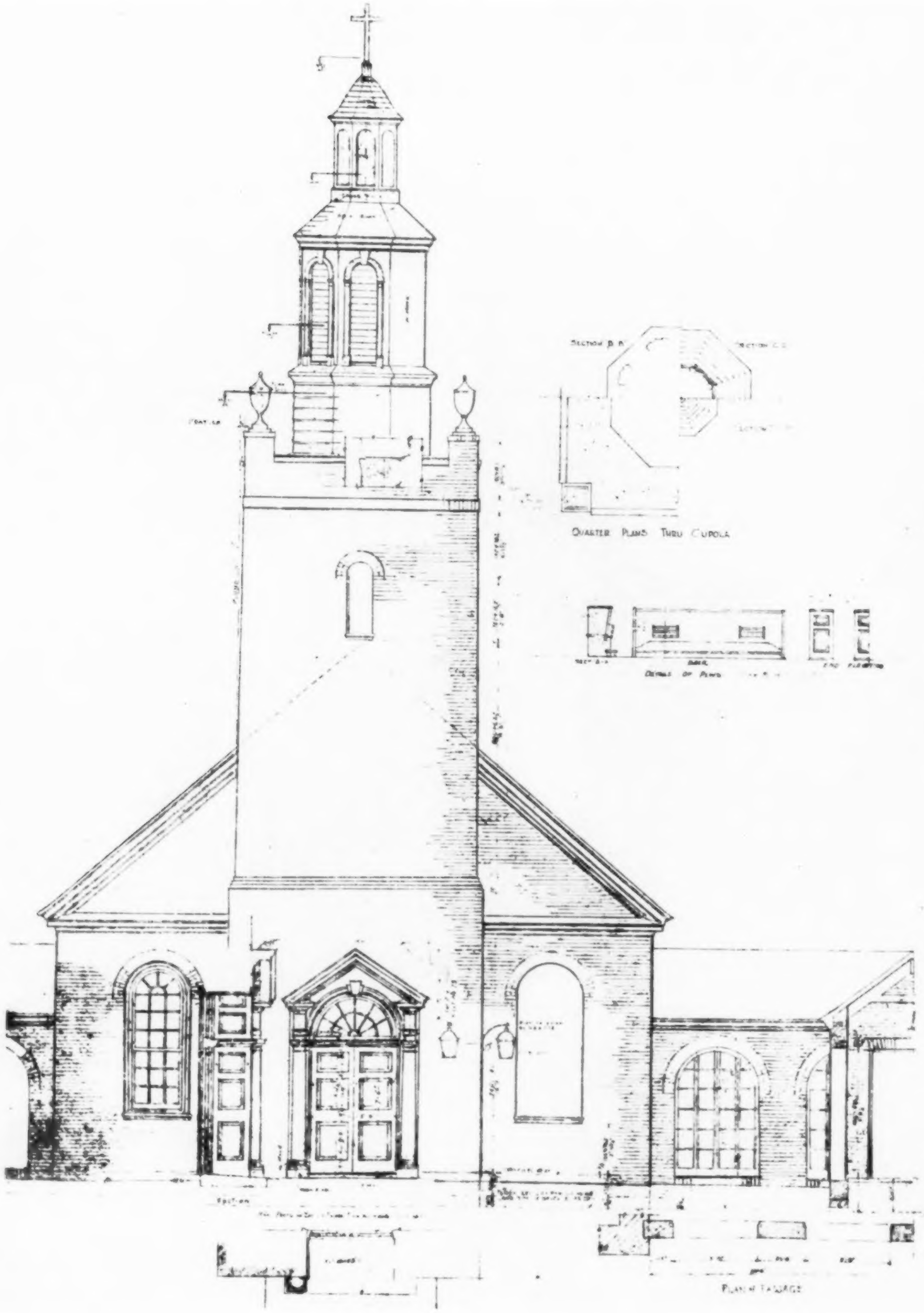
The church group is designed in the early eighteenth century architecture characteristic of other buildings in the diocese.

The arcade connecting the church and the rectory serves as a cool shady porch. The other arcade, which is inclosed in winter, gives protected communication to the church from the choir room in the parish house.

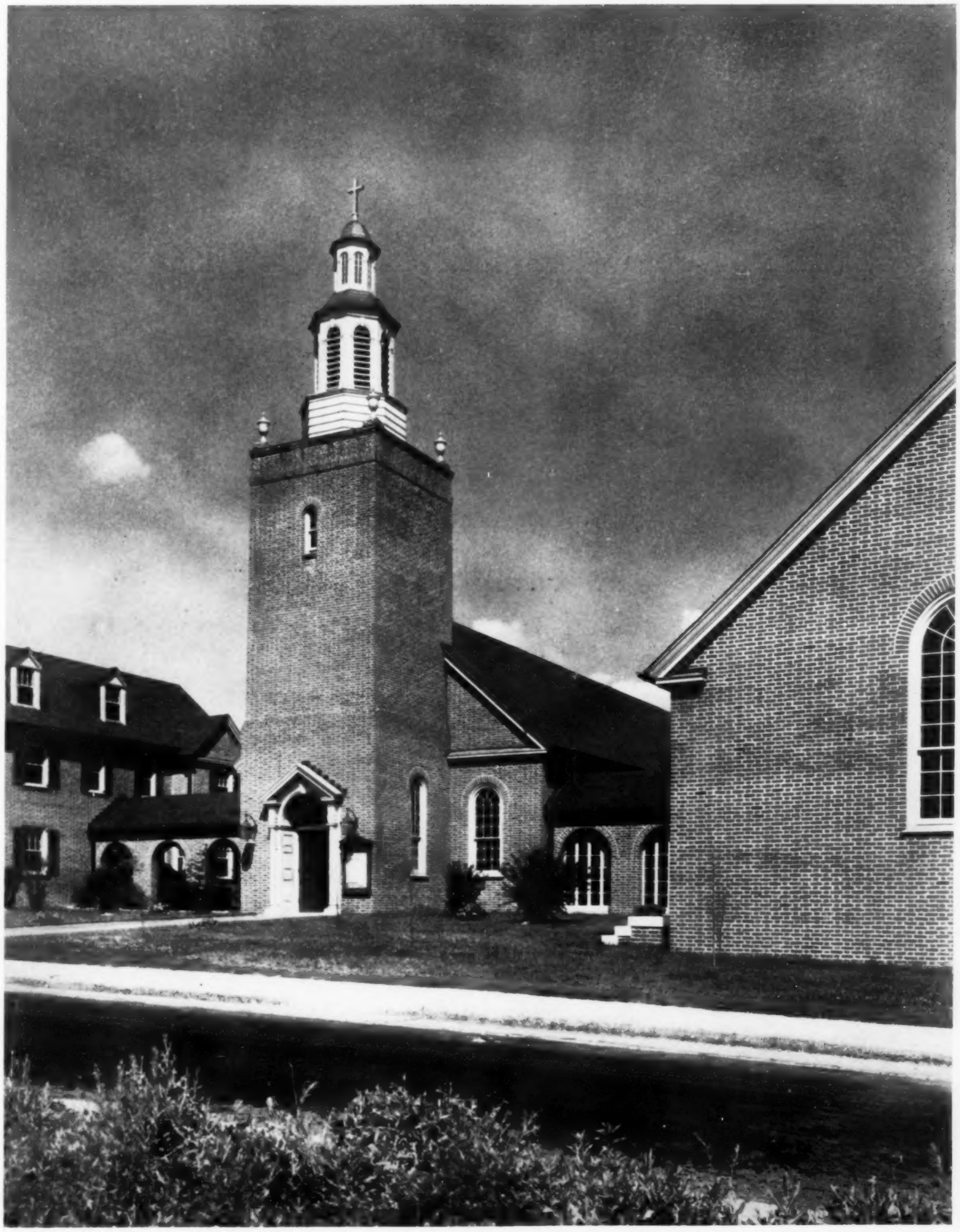
The buildings are constructed of concrete block and bonded brick for the walls, finished inside with plaster in a natural tan. The church roof has heavy pine trusses supporting purlins and planks over which a Pennsylvania black slate is laid. The floor of the nave is black and cream rubber tile; the floor of the channel and sanctuary, white marble with black inlays. The walls are finished in a dark cherry; the wood wainscot and pews, a pale tan.

Two small transepts are separated from the nave by arches. One, which can be curtained off and heated separately, contains a small chapel; the other is used as the baptistery. Both have outside access. The upper parts of the transepts accommodate the organ.

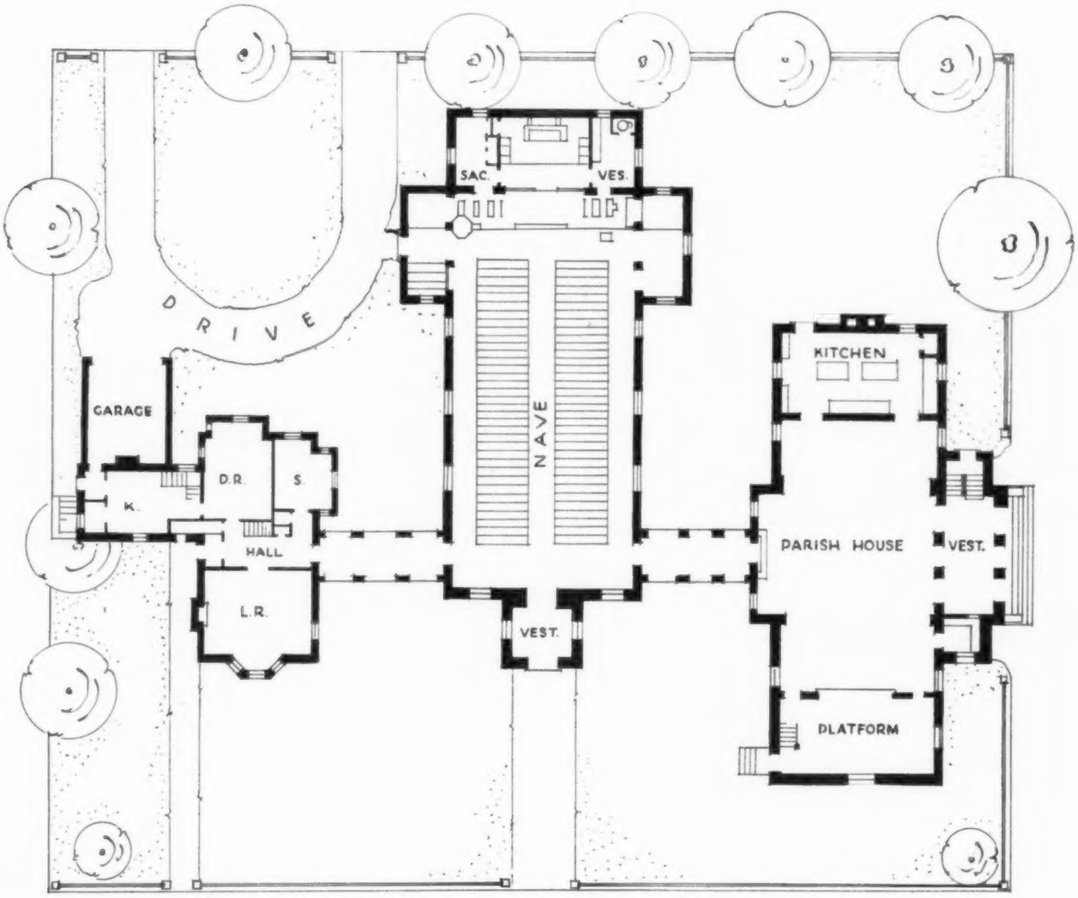
The three buildings, including site grading, planting and equipment, cost approximately $130,000.



MISSION CHURCH OF ST. GILES, STONEHURST, PHILADELPHIA
WILSON EYRE AND McILVAINE, ARCHITECTS

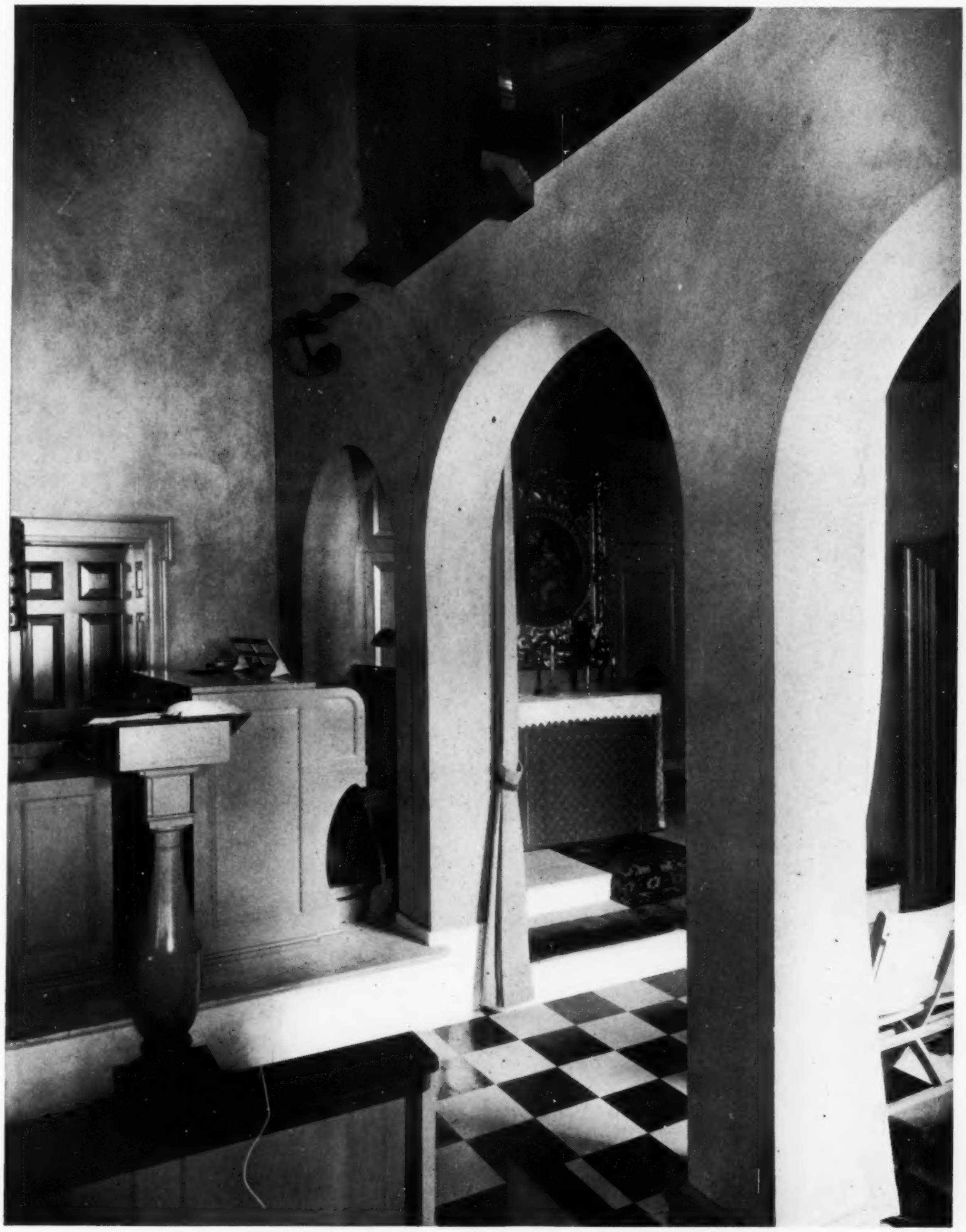


MISSION CHURCH OF ST. GILES, STONEHURST, PHILADELPHIA
WILSON EYRE AND McILVAINE, ARCHITECTS



PLOT PLAN OF CHURCH GROUP

MISSION CHURCH OF ST. GILES, STONEHURST, PHILADELPHIA
WILSON EYRE AND McILVAINE, ARCHITECTS

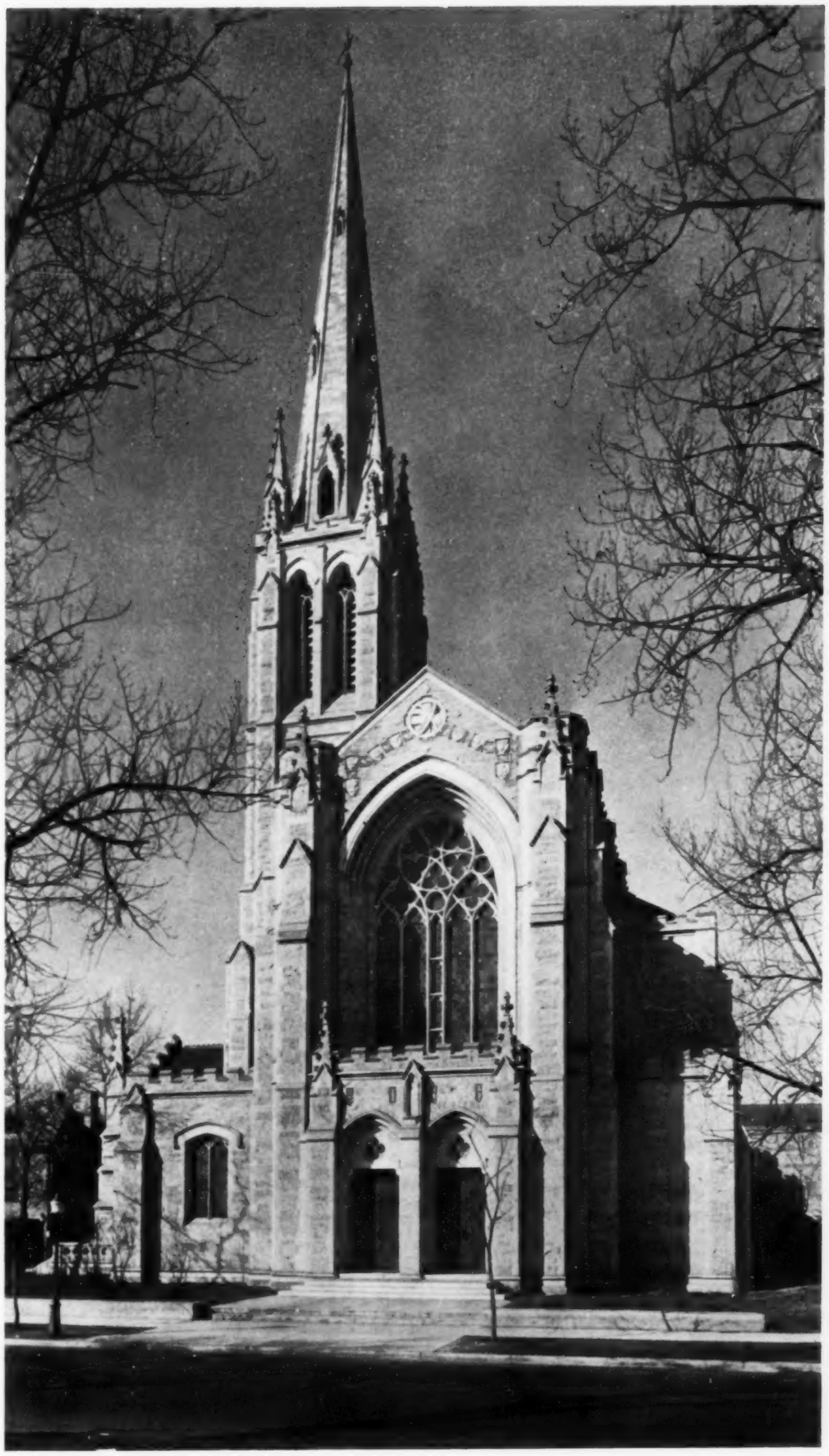


CHANCEL AND TRANSEPT CONTAINING SMALL CHAPEL

MISSION CHURCH OF ST. GILES, STONEHURST, PHILADELPHIA
WILSON EYRE AND McILVAINE, ARCHITECTS

BAPTISTERY

MISSION CHURCH OF ST. GILES, STONEHURST, PHILADELPHIA
WILSON EYRE AND McILVAINE, ARCHITECTS

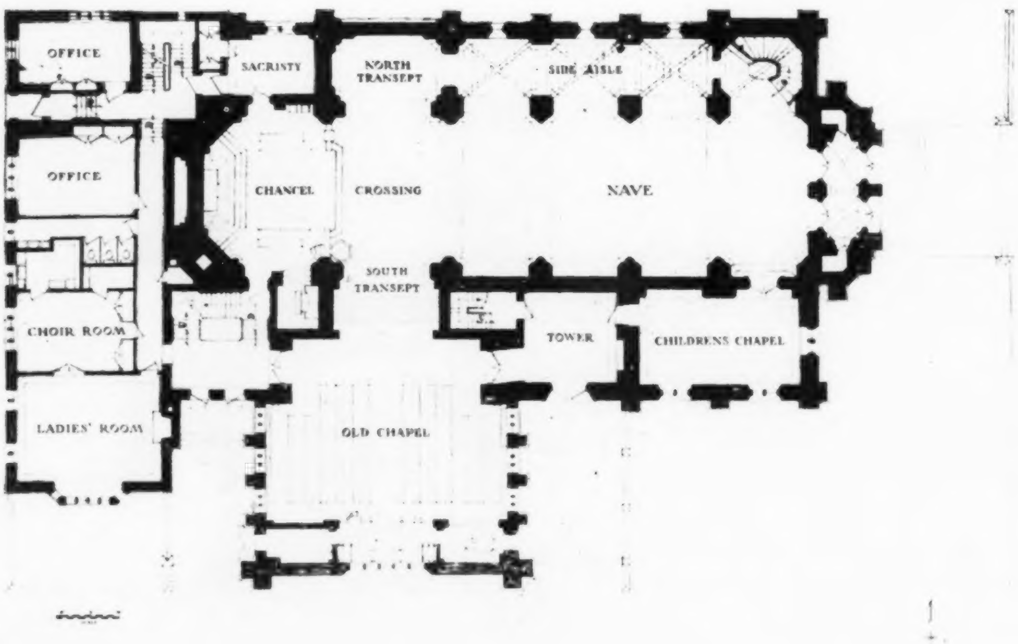


Trowbridge

FIRST UNITARIAN CHURCH, CHICAGO
DENISON B. HULL, ARCHITECT

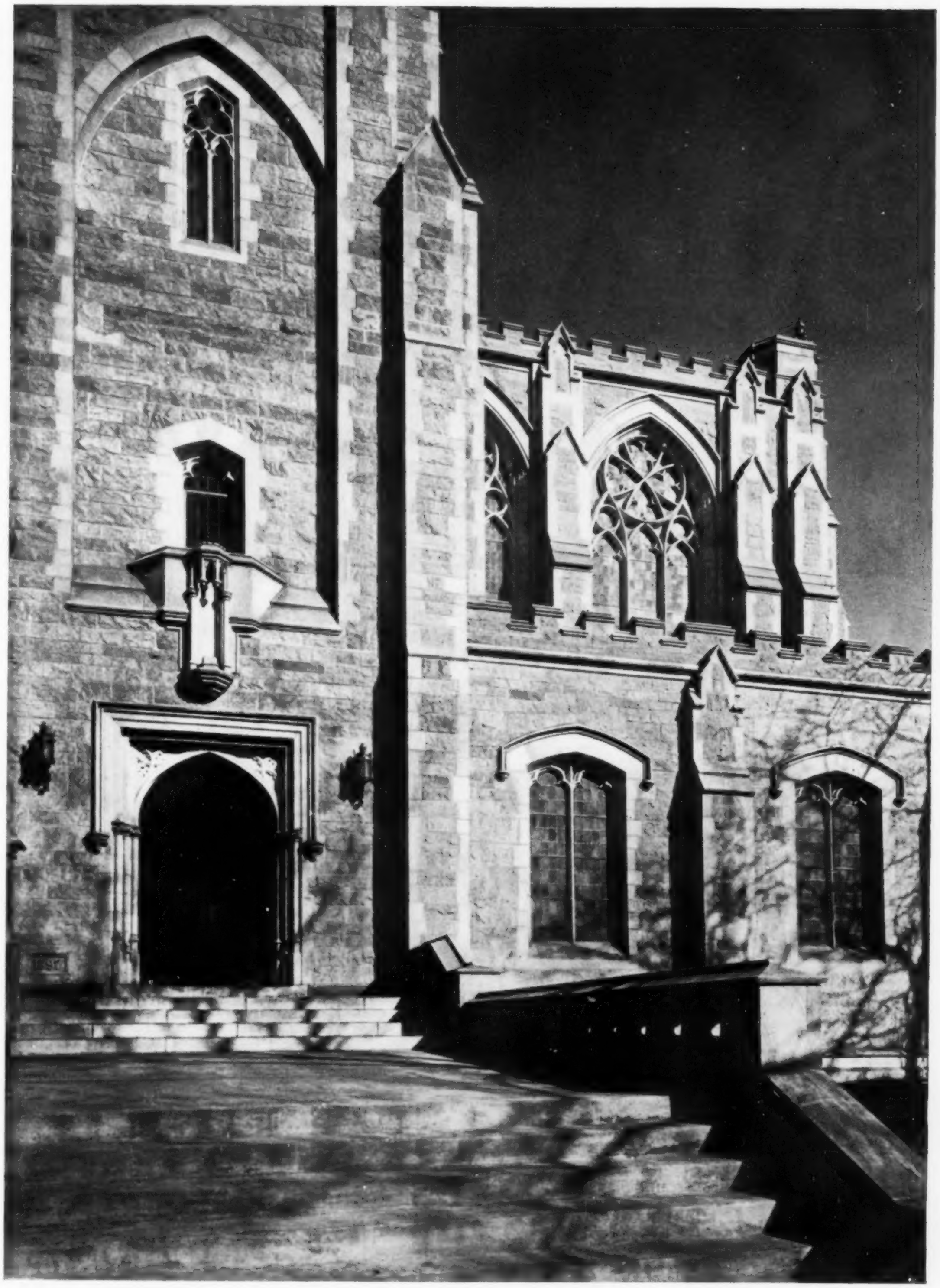
Trowbridge

Church office



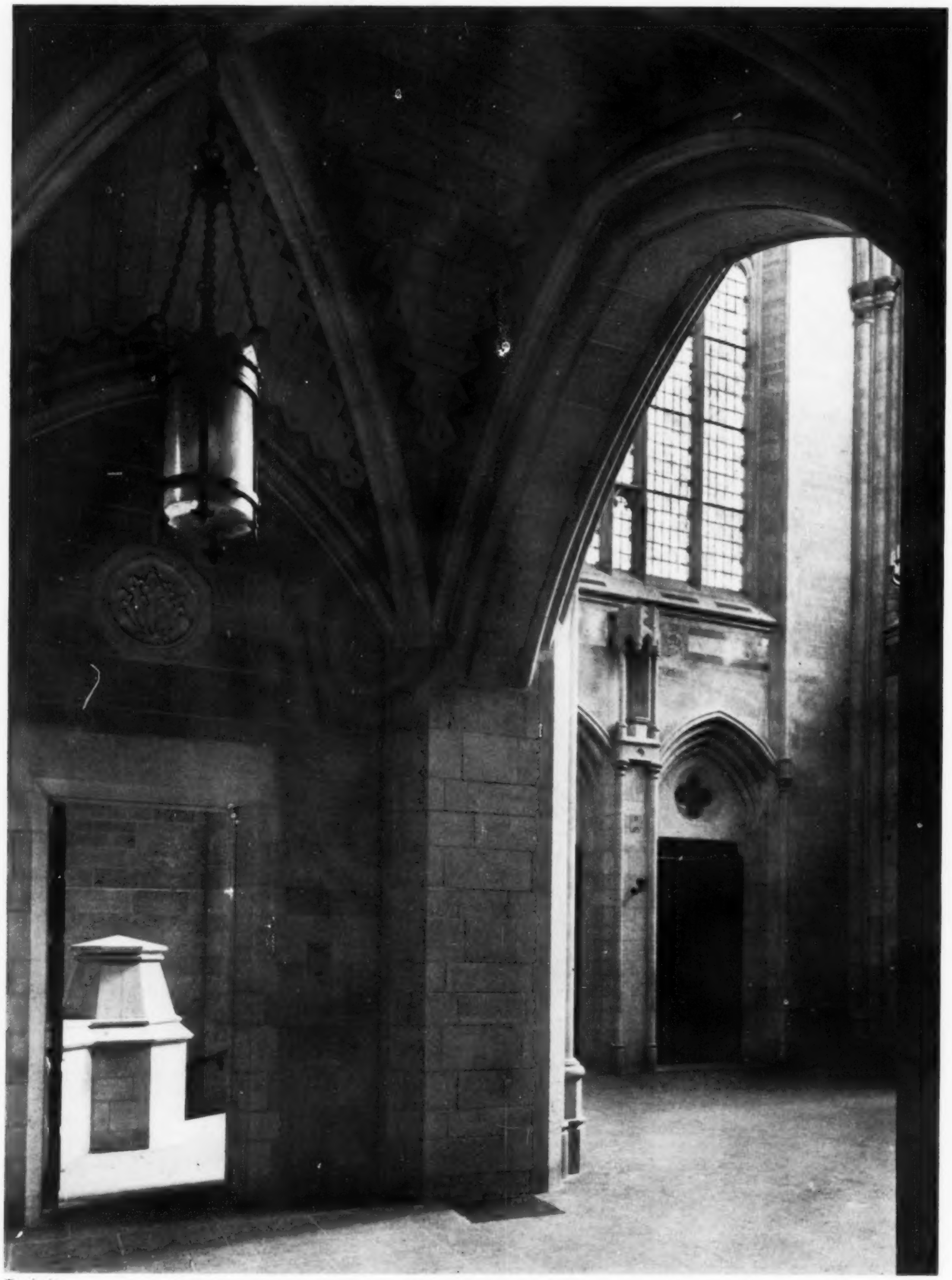
Seating capacity, about 500 persons. Total cost of church, $636,500, or 99c per cubic foot.

FIRST UNITARIAN CHURCH, CHICAGO
DENISON B. HULL, ARCHITECT



Entrance to tower, which is approximately 200 feet high. Exterior of split-faced Indiana limestone.

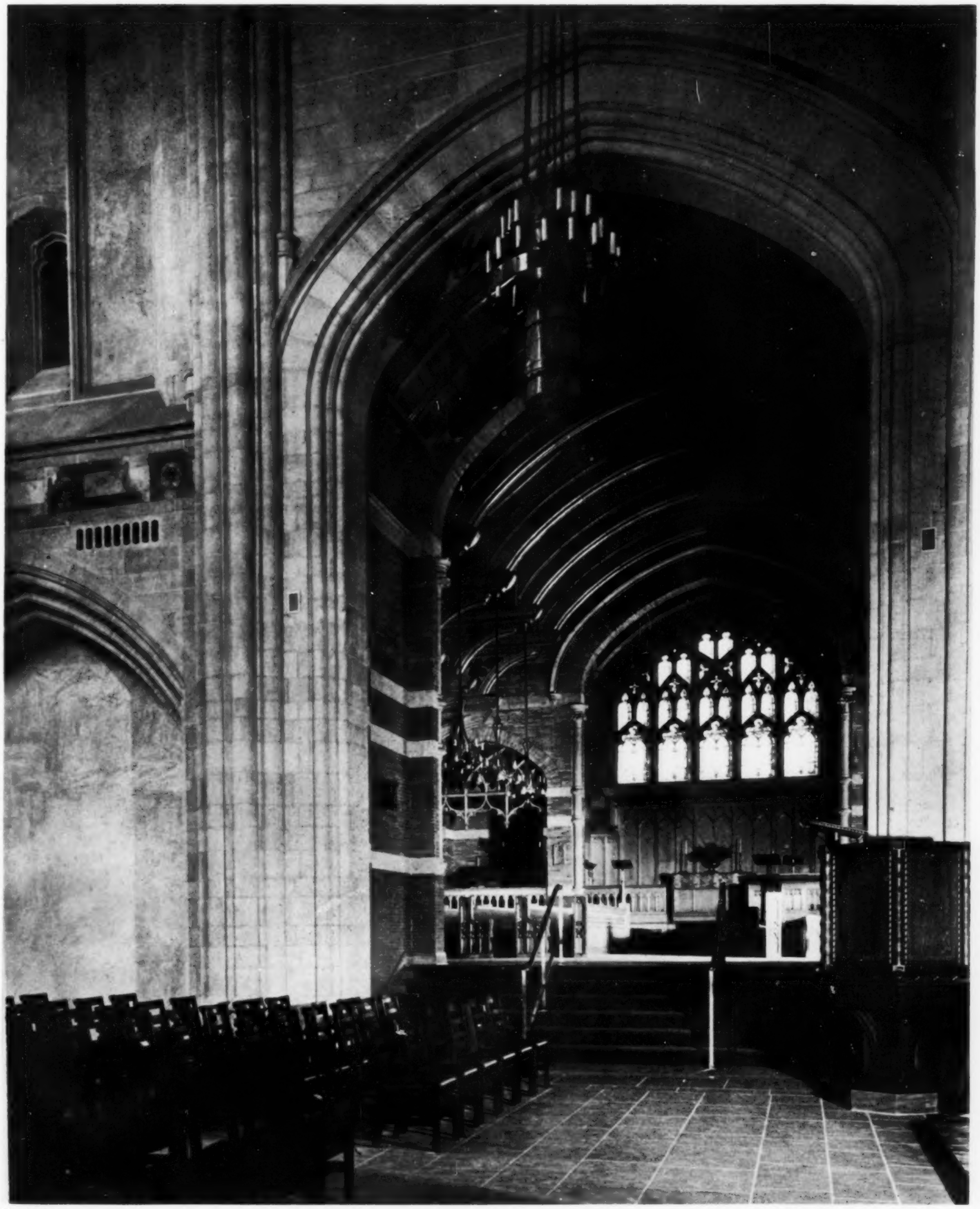
FIRST UNITARIAN CHURCH, CHICAGO
DENISON B. HULL, ARCHITECT



Trowbridge

INTERIOR OF FRONT ENTRANCE FROM SIDE AISLE

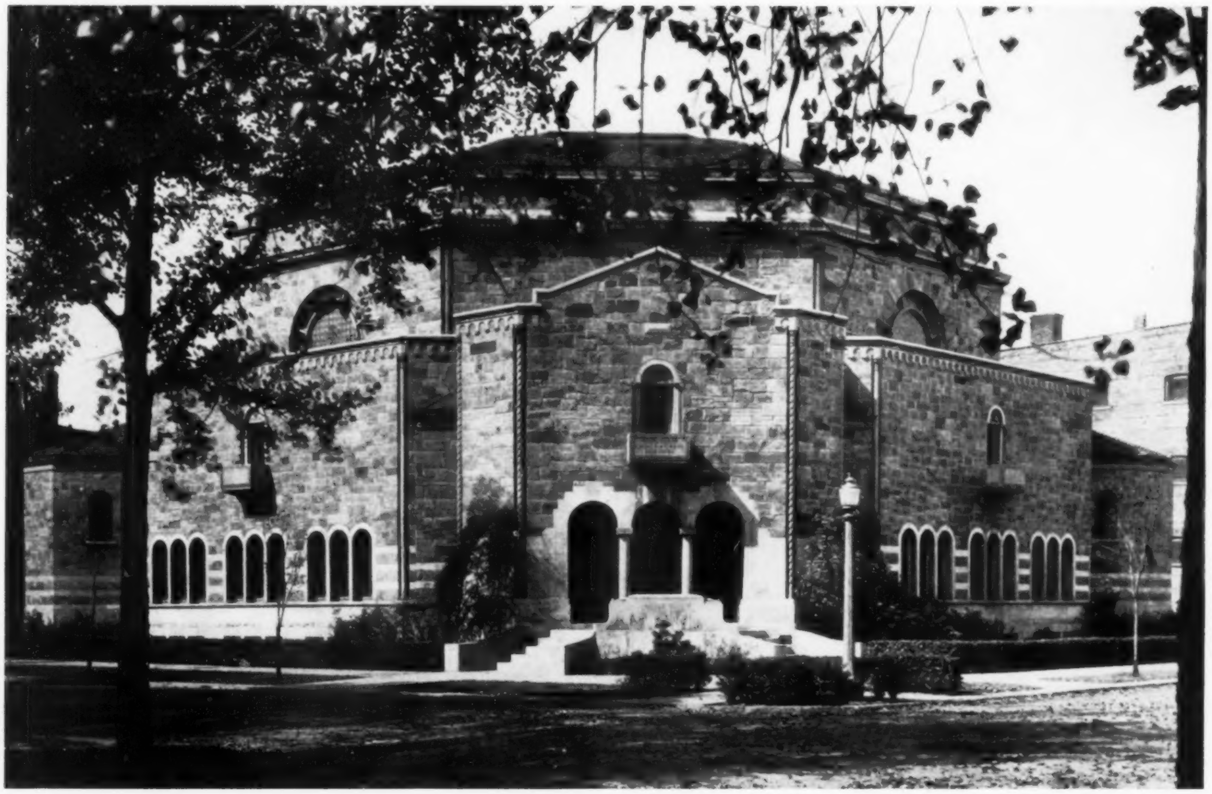
FIRST UNITARIAN CHURCH, CHICAGO
DENISON B. HULL, ARCHITECT



Trowbridge

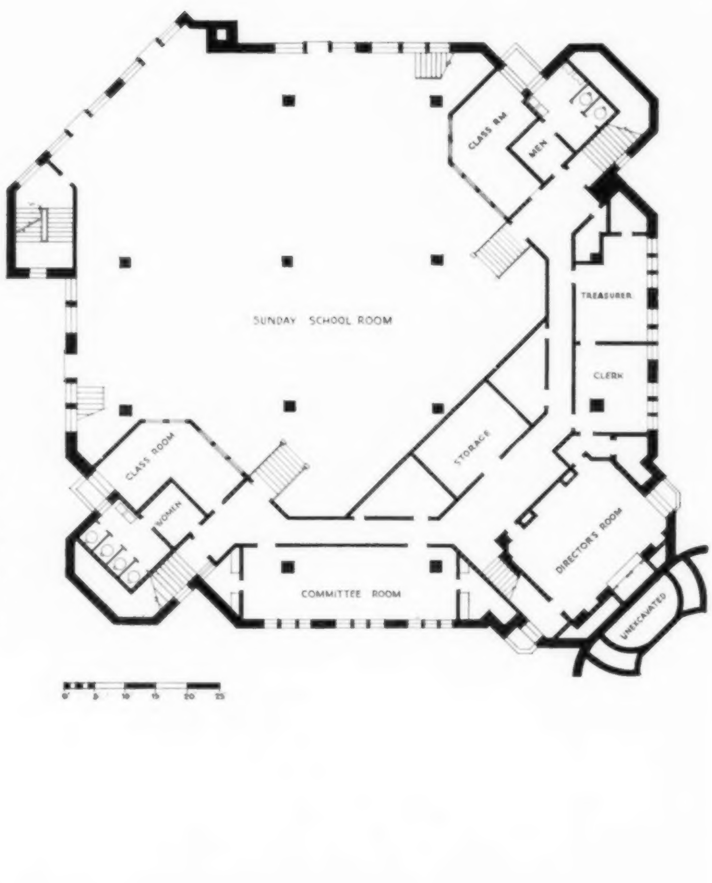
INTERIOR OF OLD CHAPEL FROM CROSSING

FIRST UNITARIAN CHURCH, CHICAGO
DENISON B. HULL, ARCHITECT

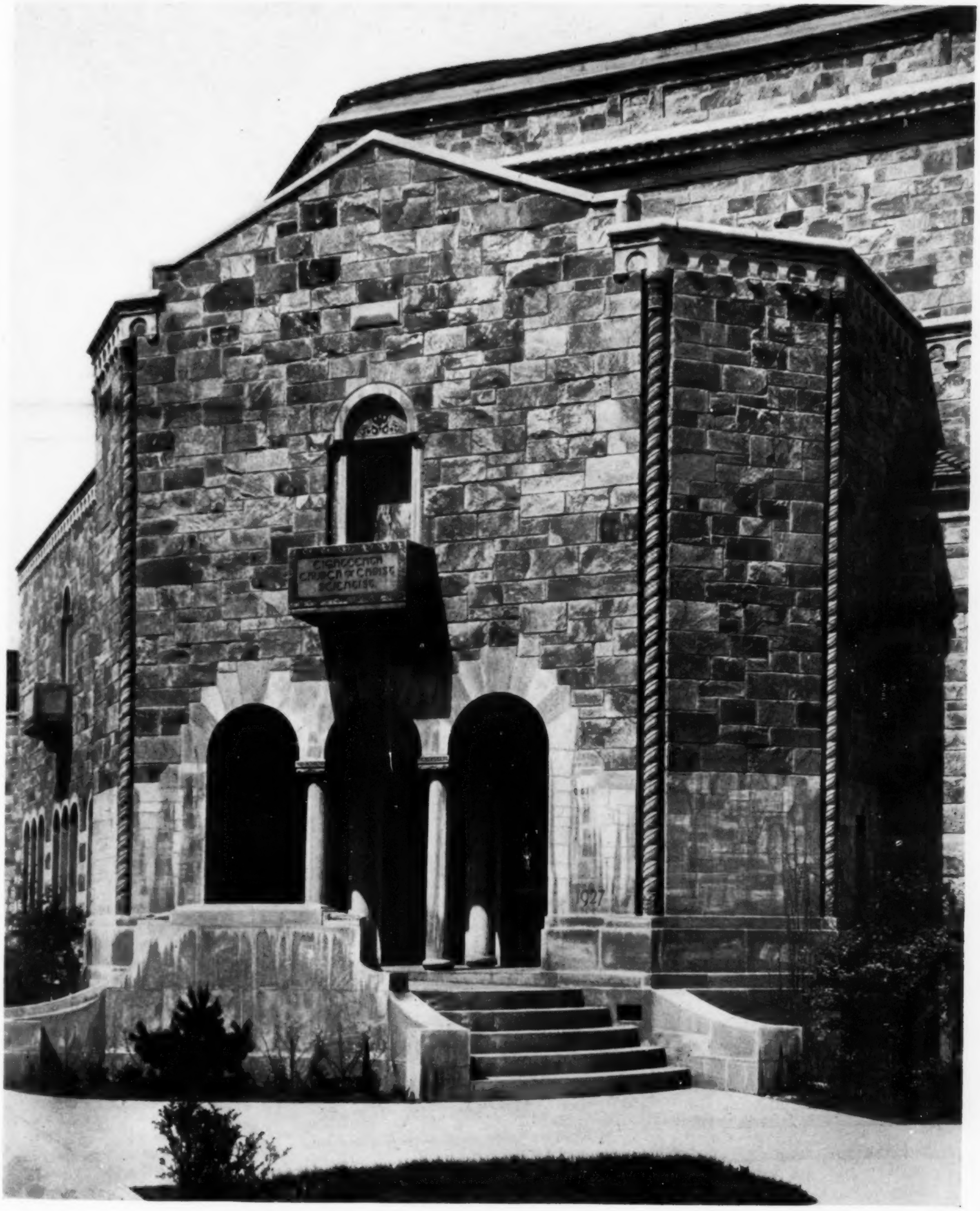


EIGHTEENTH CHURCH OF CHRIST, SCIENTIST
CHICAGO, ILLINOIS

CHARLES DRAPER FAULKNER
ARCHITECT

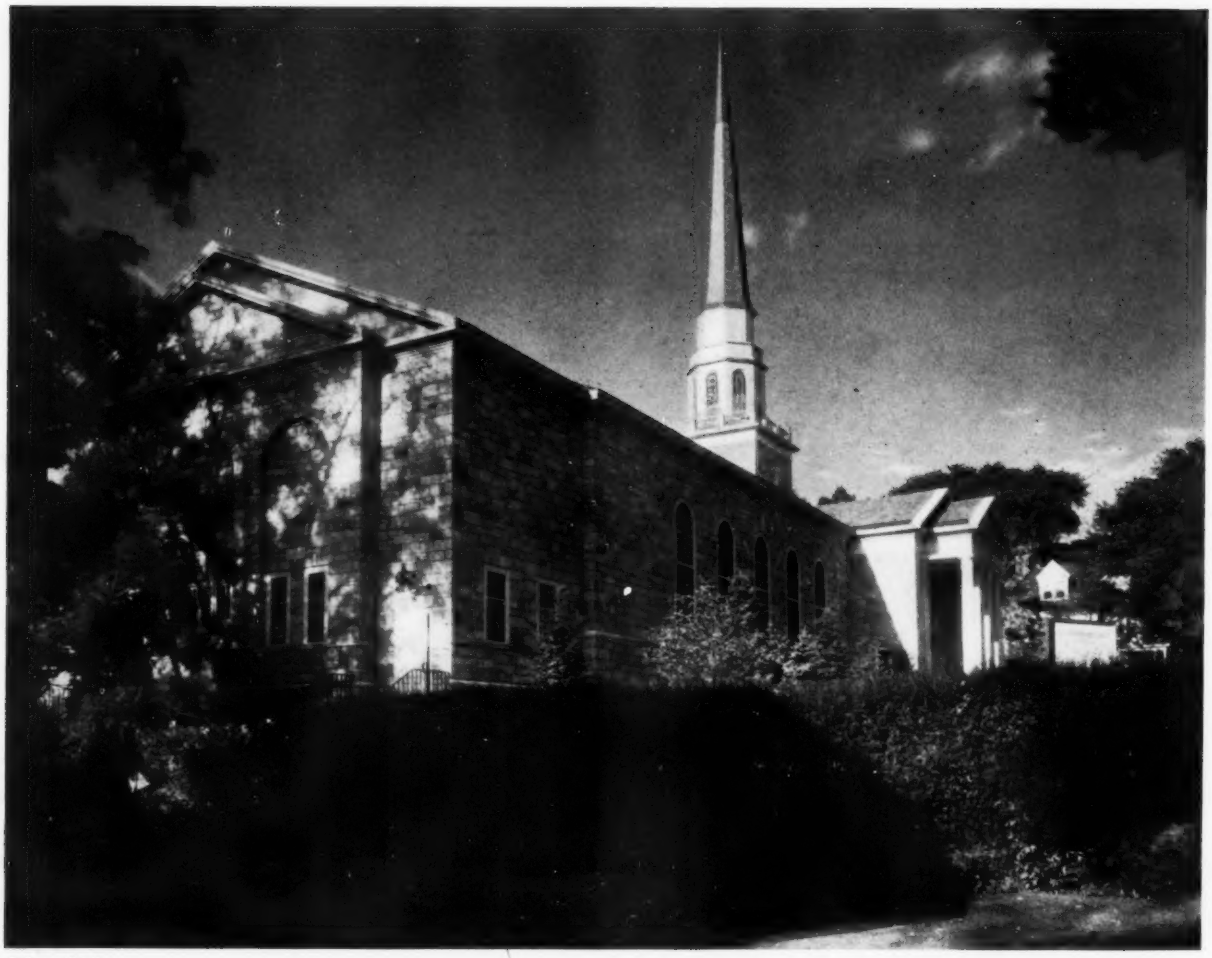


Exterior of seam-face granite trimmed with limestone. Main entrance and two side entrances lead to large U-shaped foyer on ground floor level. Auditorium is on second floor and has a seating capacity of 900 persons. Sunday school quarters are on ground floor level. Total cost, $220,000.



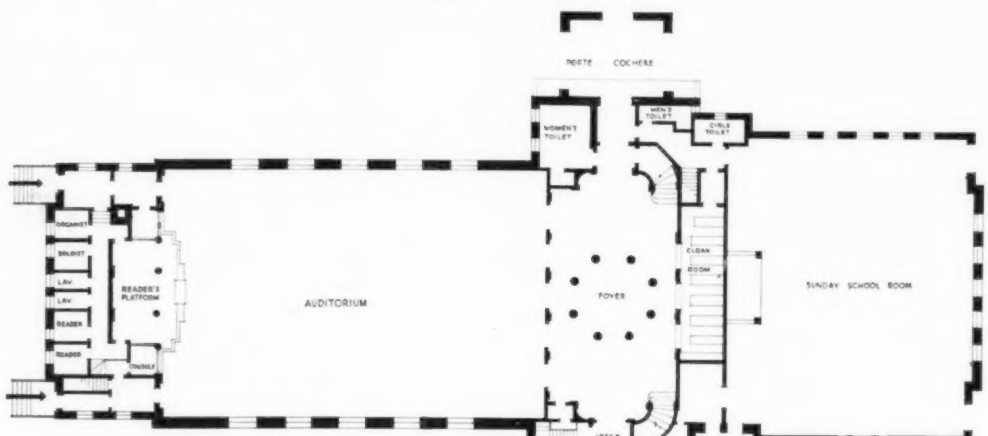
ENTRANCE DETAIL

EIGHTEENTH CHURCH OF CHRIST, SCIENTIST, CHICAGO
CHARLES DRAPER FAULKNER, ARCHITECT

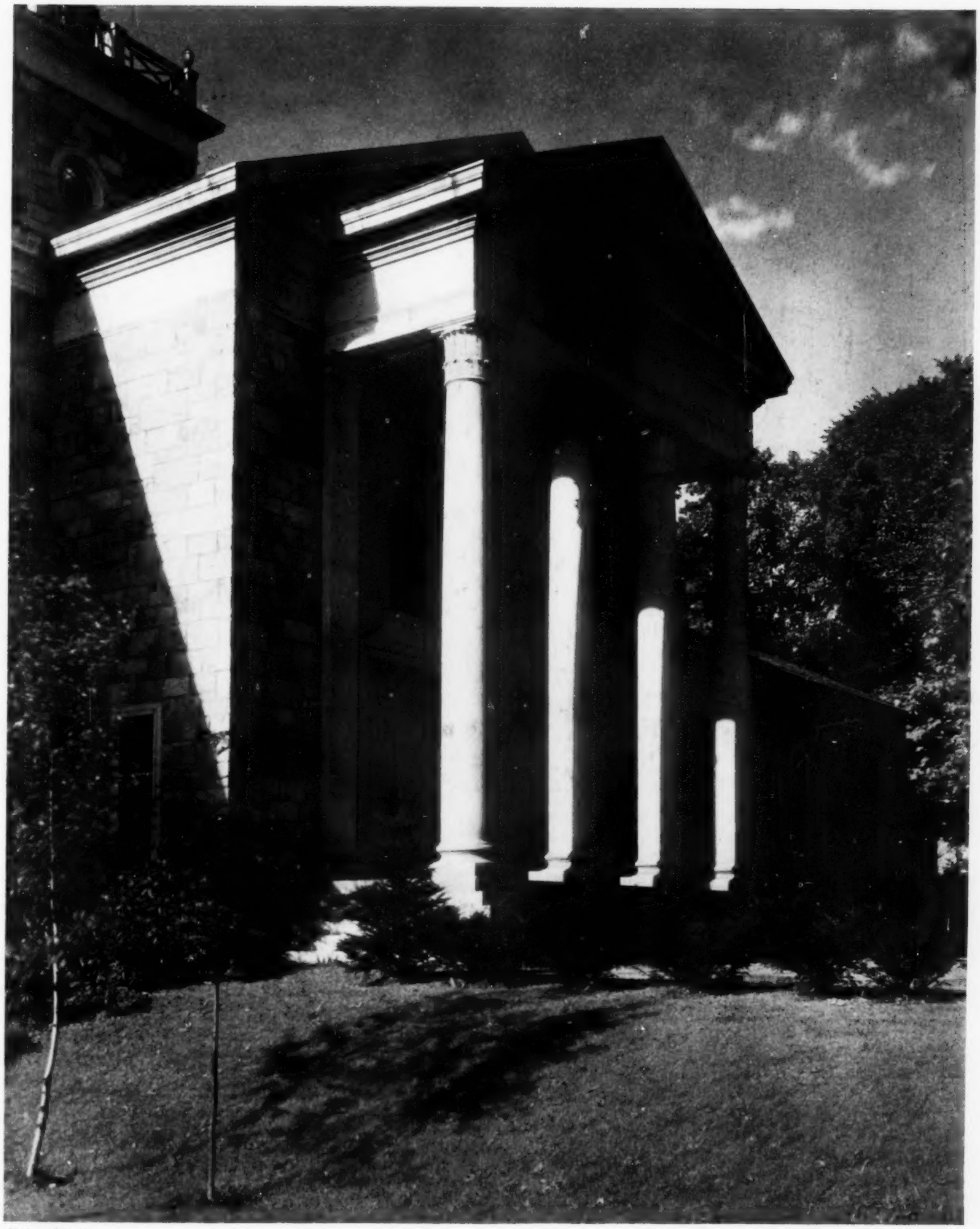


Tebbs and Knell

FIRST CHURCH OF CHRIST, SCIENTIST, AT MONTCLAIR, N. J.
CHARLES DRAPER FAULKNER, ARCHITECT
C. WILLARD WANDS, ASSOCIATE ARCHITECT



Auditorium seats 750 to 800 persons. Total cost, $240,000.



Tebbs and Knell

FIRST CHURCH OF CHRIST, SCIENTIST, AT MONTCLAIR, N. J.
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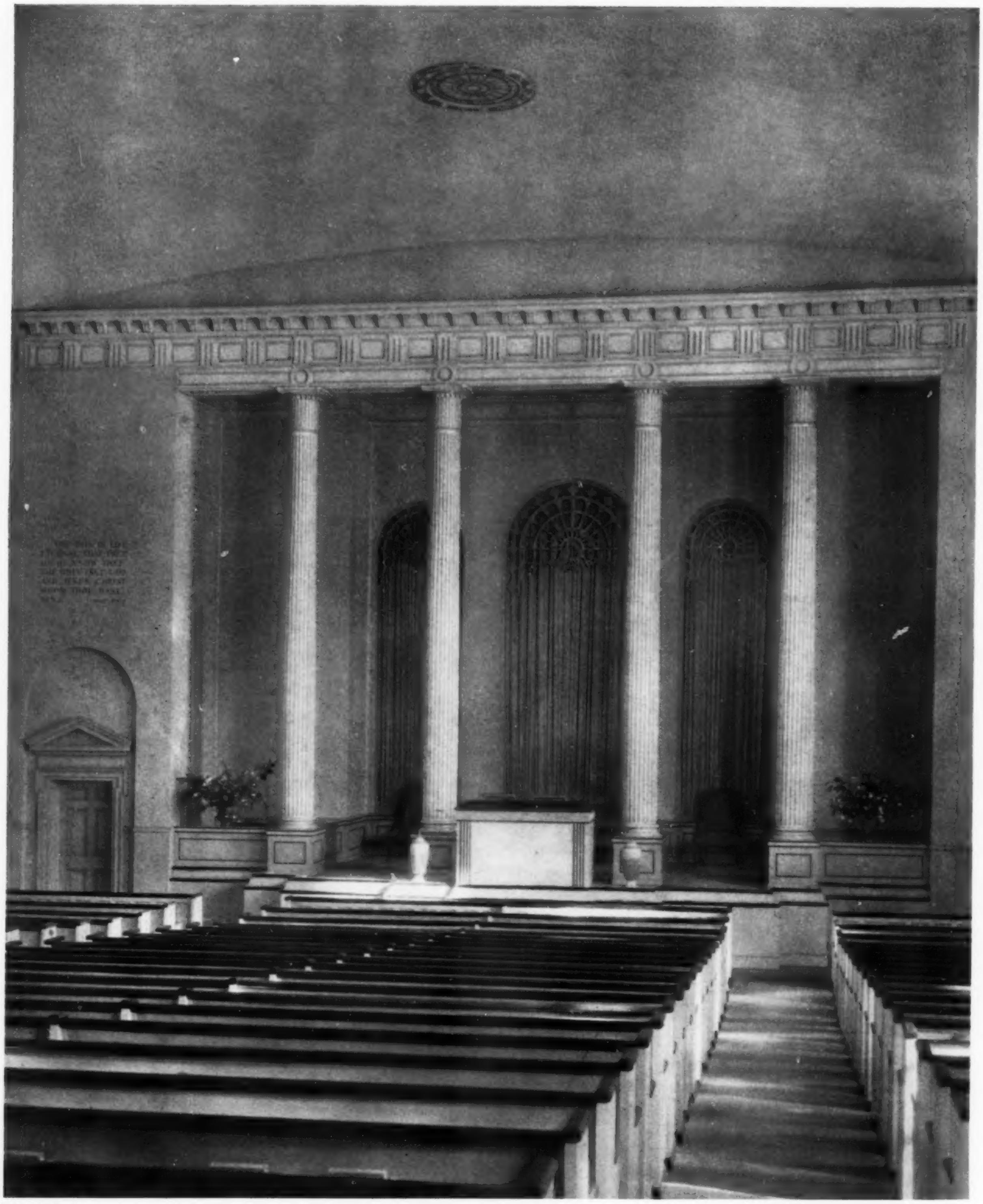
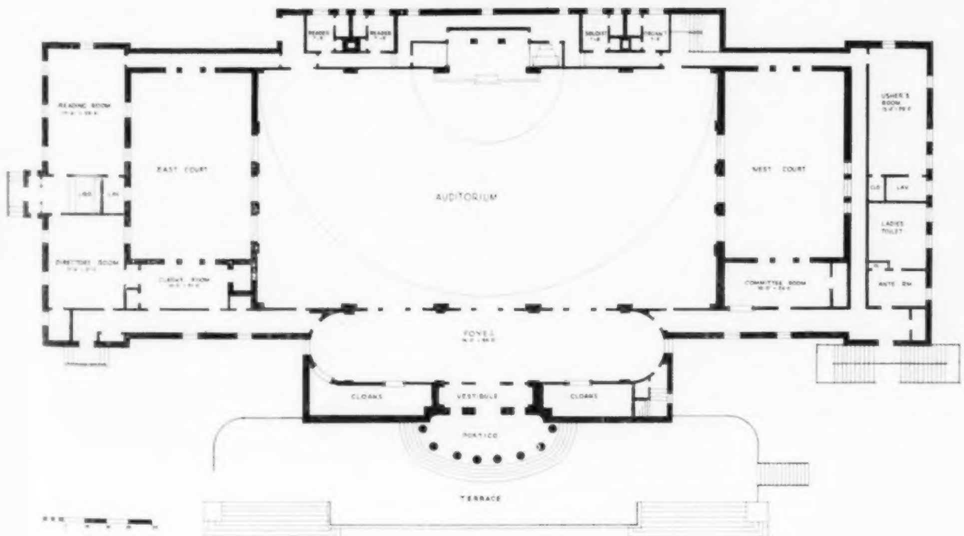


Tebbs and Knell

READER'S PLATFORM AND AUDITORIUM

FIRST CHURCH OF CHRIST, SCIENTIST, AT MONTCLAIR, N. J.
CHARLES DRAPER FAULKNER, ARCHITECT
C. WILLARD WANDS, ASSOCIATE ARCHITECT



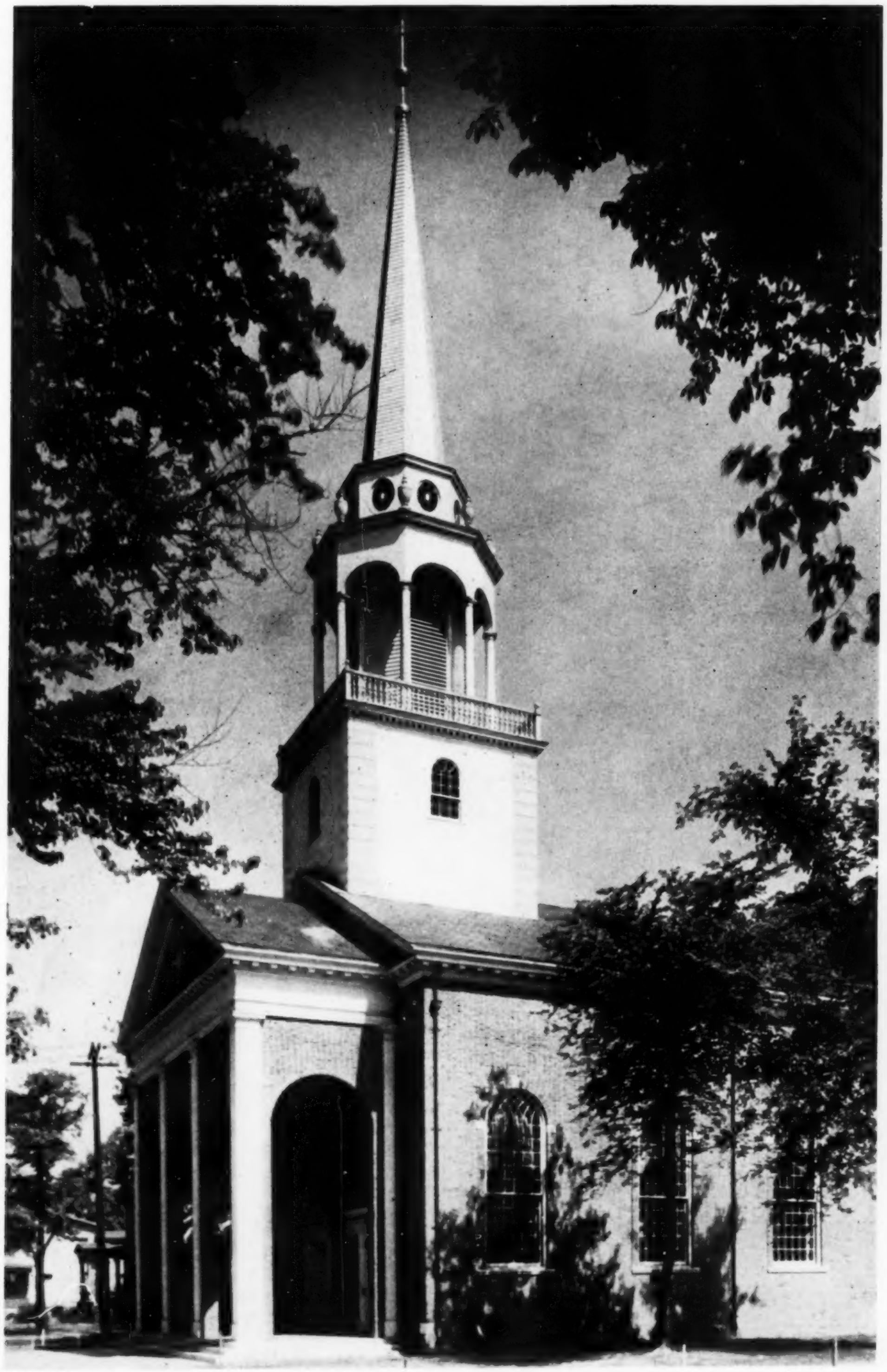
FOURTH CHURCH
OF CHRIST, SCIENTIST
MILWAUKEE
C. D. FAULKNER
ARCHITECT

Auditorium seats 950 to 1,000 persons. The broad foyer gives unusual exit facilities. The two open courts are landscaped. Total cost, $190,000.

Tebbs and Knell

READER'S PLATFORM AND AUDITORIUM

FOURTH CHURCH OF CHRIST, SCIENTIST, IN MILWAUKEE
CHARLES DRAPER FAULKNER, ARCHITECT



Tebbs and Knell

FIRST PRESBYTERIAN CHURCH AT HACKENSACK, N. J.
E. P. MELLON, ARCHITECT
W. L. SMITH, ASSOCIATE

Tebbs and Knell

FIRST PRESBYTERIAN CHURCH
HACKENSACK, N. J.

E. P. MELLON, ARCHITECT
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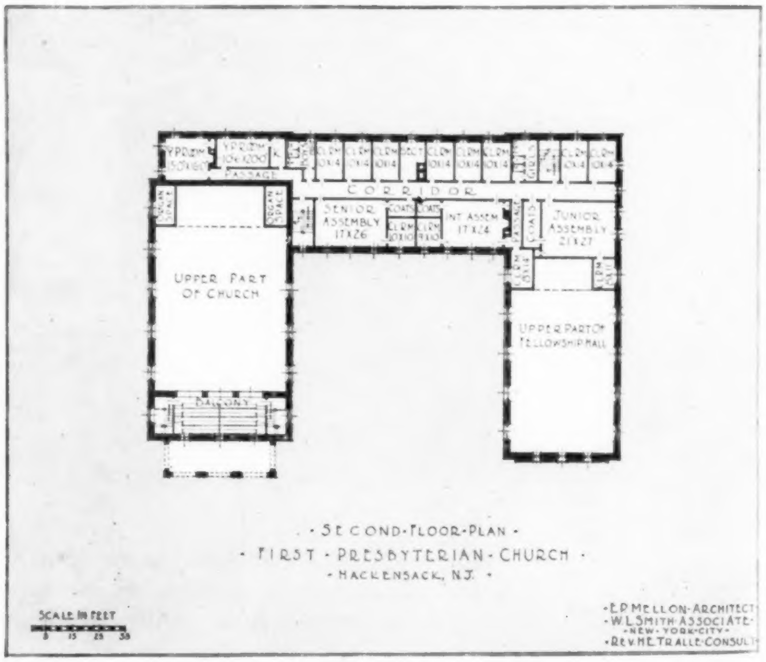
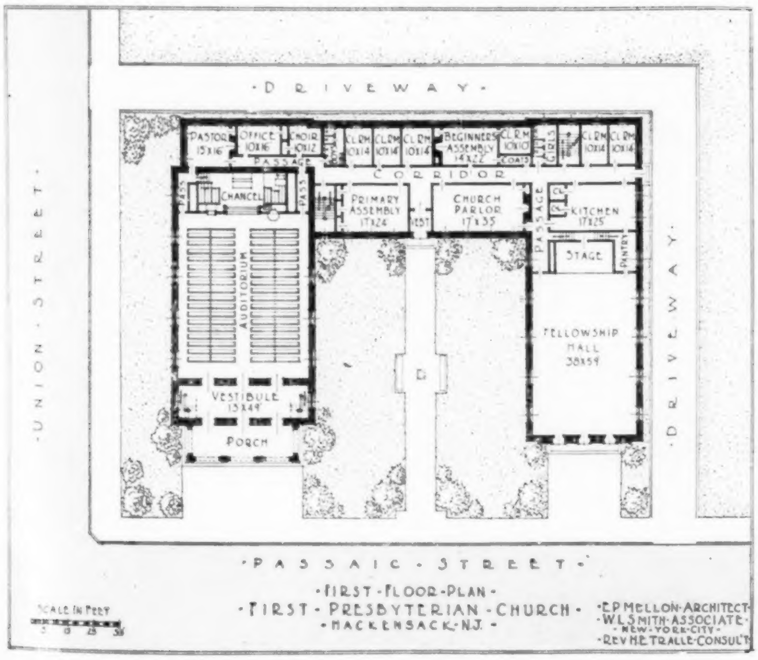


Tebbs and Knell



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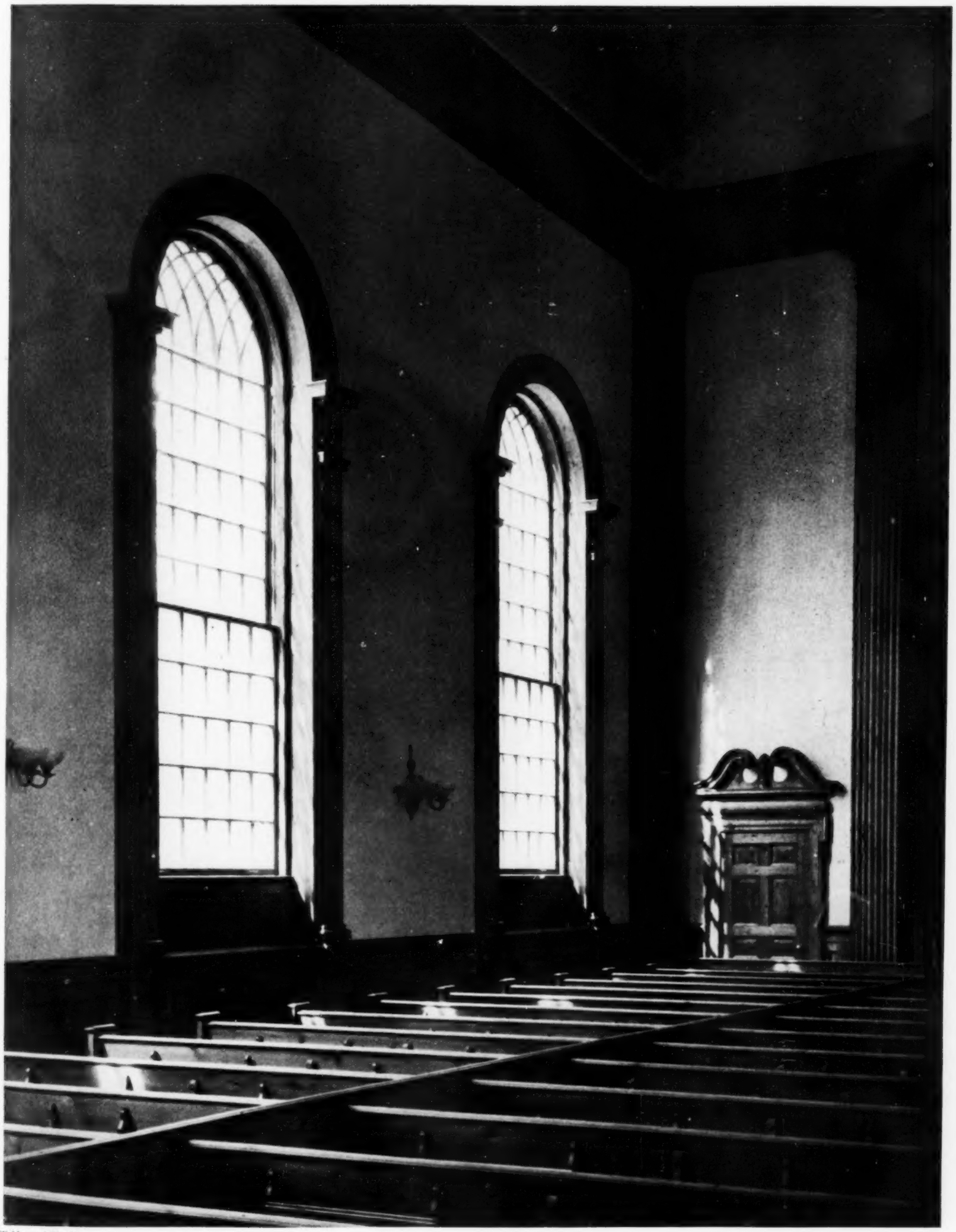

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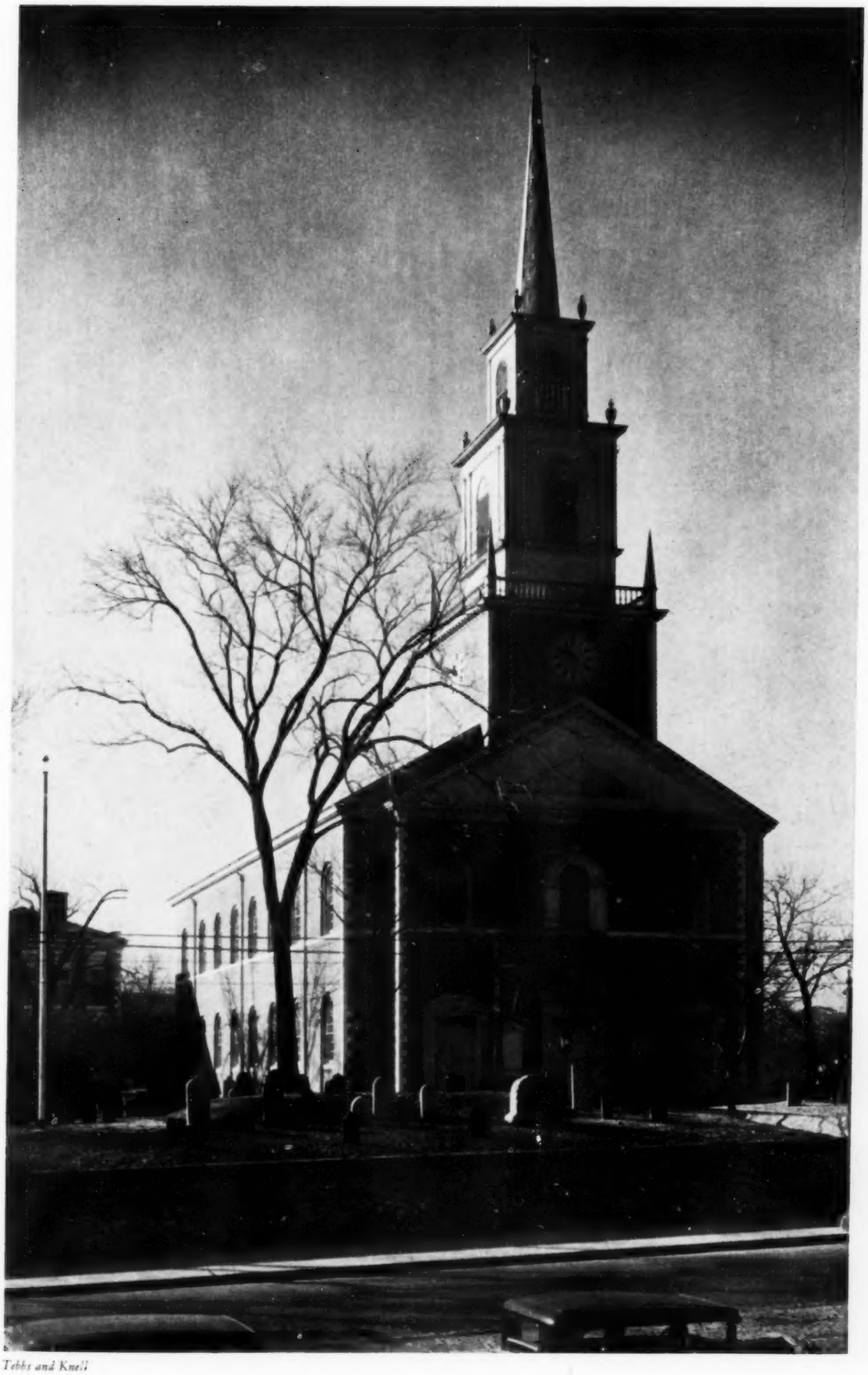
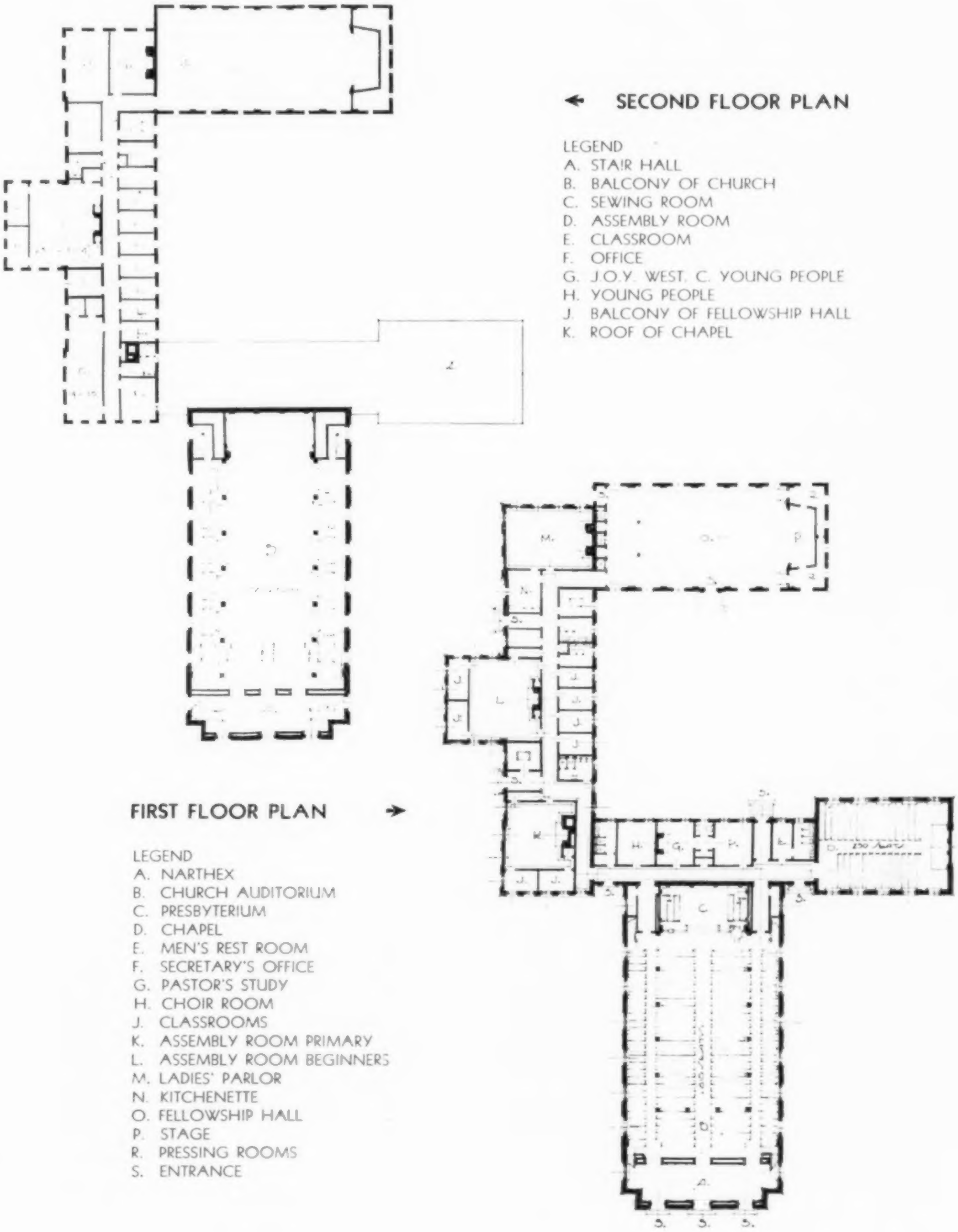


Tebbs and Knell

FIRST PRESBYTERIAN CHURCH AT ORANGE, N. J.
E. P. MELLON, ARCHITECT
W. L. SMITH, ASSOCIATE



← SECOND FLOOR PLAN

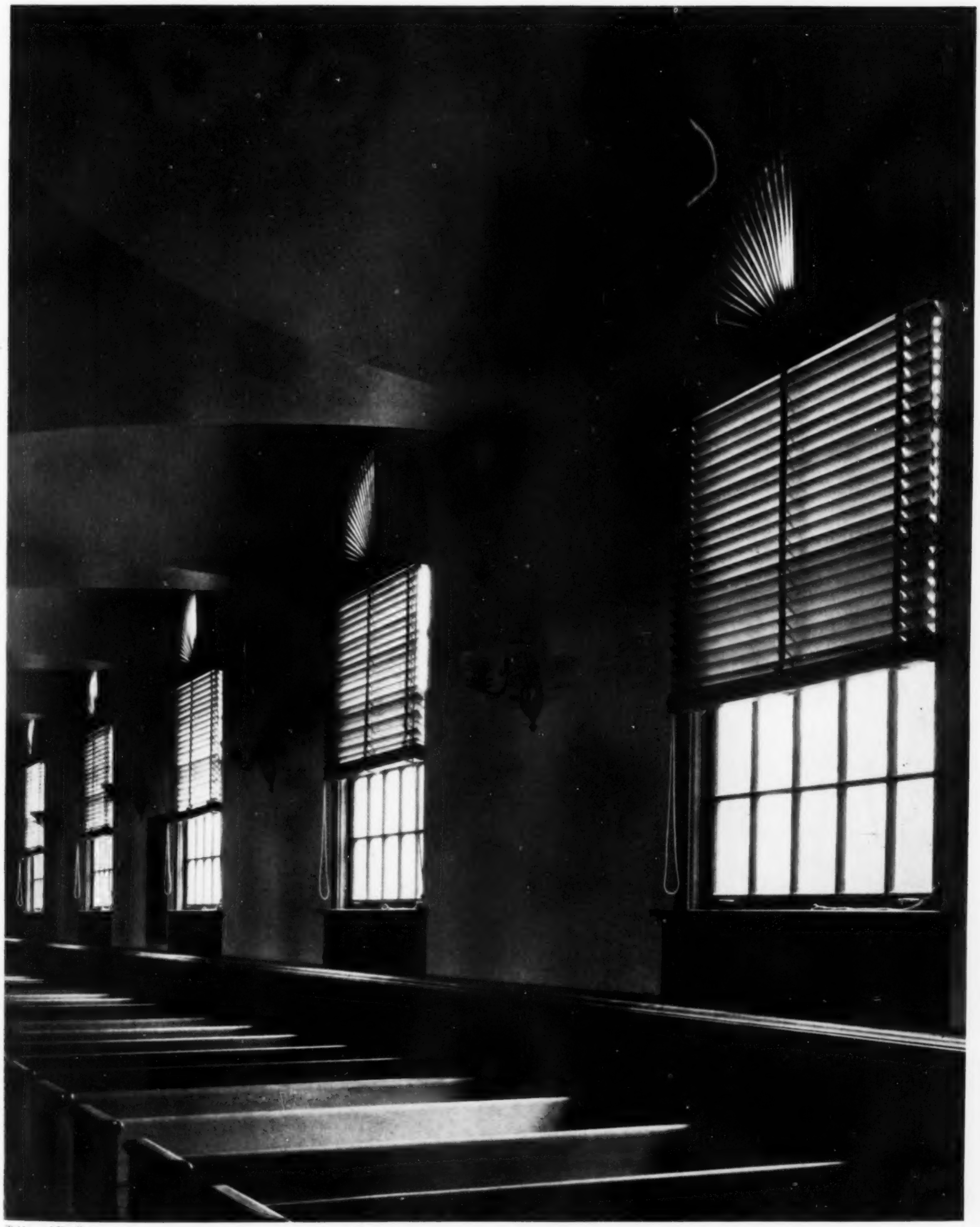
LEGEND
A. STAIR HALL
B. BALCONY OF CHURCH
C. SEWING ROOM
D. ASSEMBLY ROOM
E. CLASSROOM
F. OFFICE
G. J.O.Y. WEST. C. YOUNG PEOPLE
H. YOUNG PEOPLE
J. BALCONY OF FELLOWSHIP HALL
K. ROOF OF CHAPEL

FIRST FLOOR PLAN →

LEGEND
A. NARTHEX
B. CHURCH AUDITORIUM
C. PRESBYTERIUM
D. CHAPEL
E. MEN'S REST ROOM
F. SECRETARY'S OFFICE
G. PASTOR'S STUDY
H. CHOIR ROOM
J. CLASSROOMS
K. ASSEMBLY ROOM PRIMARY
L. ASSEMBLY ROOM BEGINNERS
M. LADIES' PARLOR
N. KITCHENETTE
O. FELLOWSHIP HALL
P. STAGE
R. PRESSING ROOMS
S. ENTRANCE

CHURCH AND SUNDAY SCHOOL BUILDING

FIRST PRESBYTERIAN CHURCH AT ORANGE, N. J.
E. P. MELLON, ARCHITECT
W. L. SMITH, ASSOCIATE



Tebbs and Knell

FIRST PRESBYTERIAN CHURCH AT ORANGE, N. J.
E. P. MELLON, ARCHITECT
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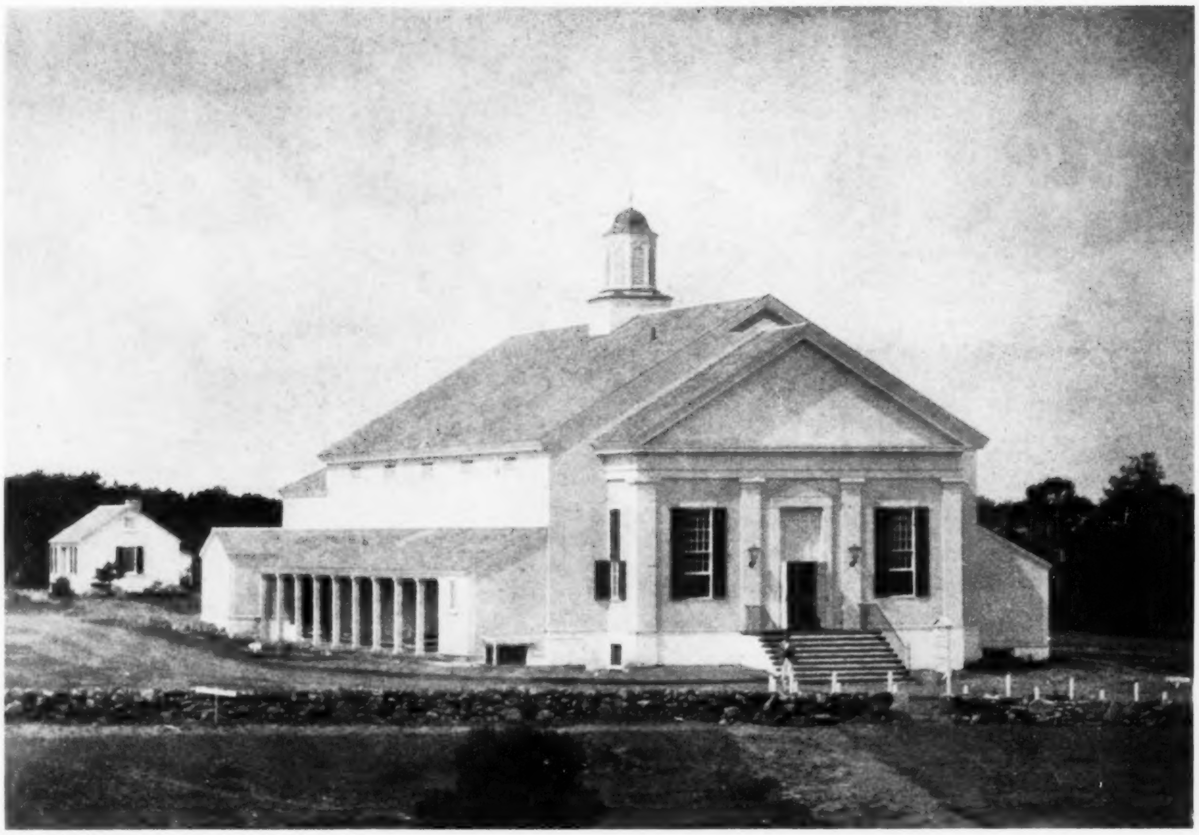


Vandamm Studio

CAPE CINEMA, DENNIS, MASSACHUSETTS

RODGERS AND POOR, ARCHITECTS

The theater follows the precedent of early Cape Cod architecture. The exterior is painted white with green blinds. The arcades along the side are used for serving coffee and tea between performances.

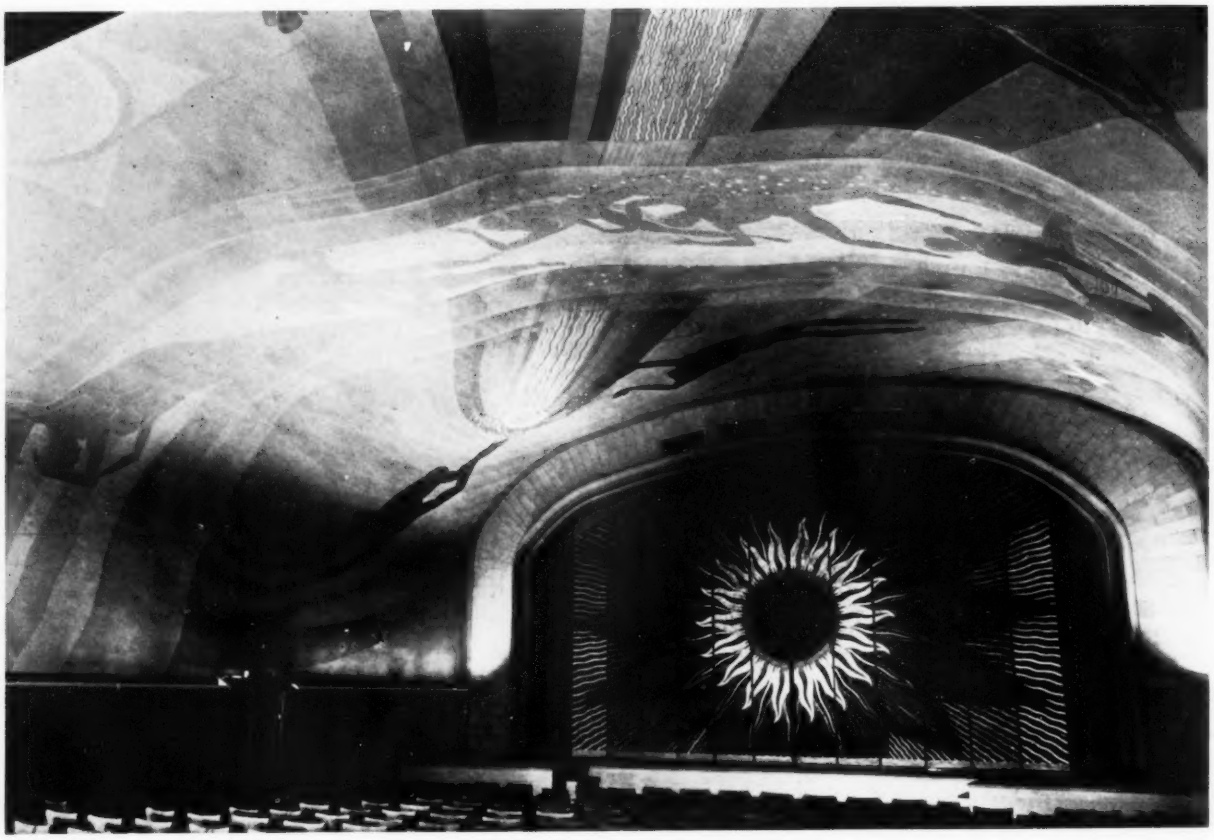
The auditorium has 317 seats, 30 of which are in a shallow balcony at the rear. The rows of especially designed armchairs are spaced so that patrons may remain seated while others pass in front. The chairs are covered in apricot colored suede cloth and the woodwork is lacquered black.

The ceiling is in the form of an elliptical vault springing from a high wainscot. Murals and screen are by Rockwell Kent and J. Malzenar. The decorations represent the constellations of the sky and the Milky Way in tones of deep blue, orange, gold and silver. The curtain is a folding screen, worked by an electric motor. It is painted an orange suede; its brilliant blue and gold rays represent the sun.

To overcome echoes the wainscot and the proscenium molding were covered with acoustic tile. The back wall above the balcony was insulated with acoustic felt.

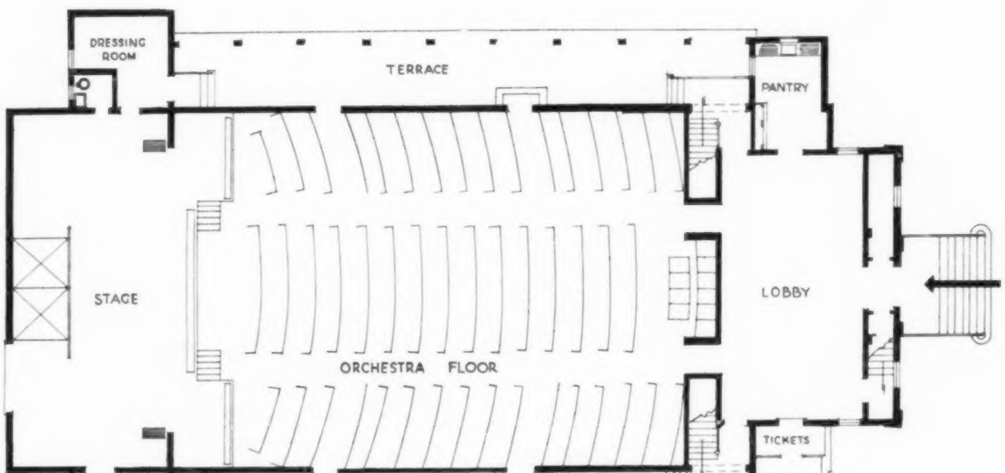
The proscenium opening was designed to be of sufficient width to take care of the future Grandeur screen. The stage was designed with footlights, space for orchestra, and ample back stage space so that the house could be used for plays or concerts when desired.

The theater has been running to capacity houses every day and has been immensely successful in this, its first summer.



Vandamm Studio

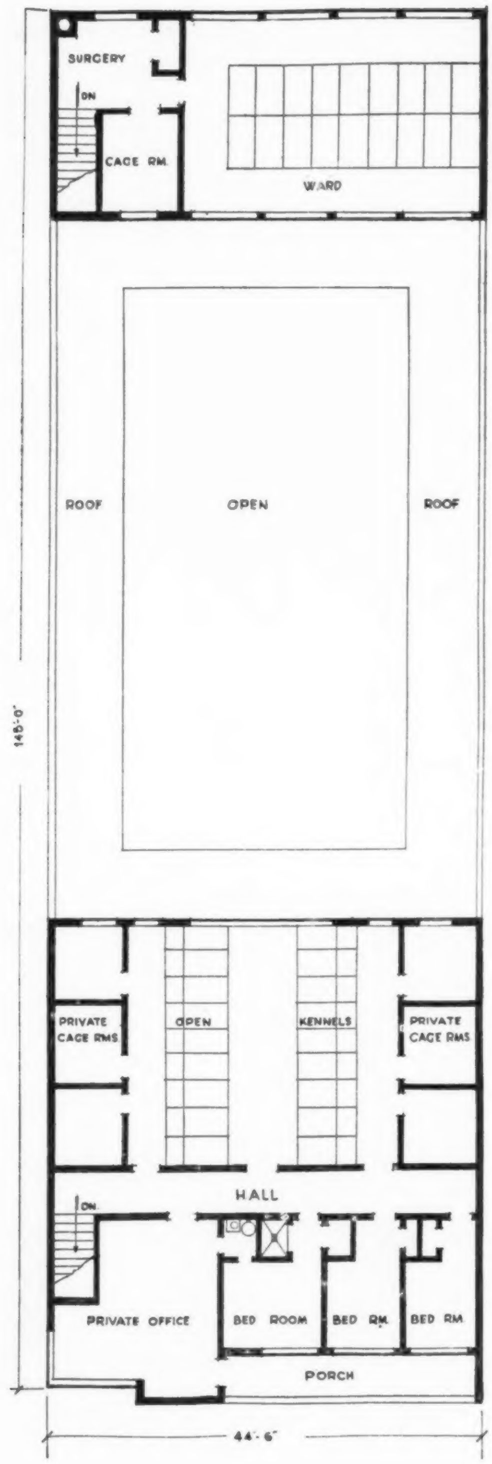
MURAL AND SCREEN BY ROCKWELL KENT AND J. MALZENAR
CAPE CINEMA, DENNIS, MASSACHUSETTS
RODGERS AND POOR, ARCHITECTS



MAIN FLOOR PLAN

Mott Studios

MOXLEY'S DOG AND CAT HOSPITAL
HOLLYWOOD, CALIFORNIA



MOXLEY'S DOG AND CAT HOSPITAL
HOLLYWOOD, CALIFORNIA

A MODEL SHOPPING VILLAGE IN TEXAS

FOOSHEE AND CHEEK, ARCHITECTS

The town of Highland Park is a highly restricted residential section comprising 1,400 acres; it is a separate municipality although an integral part of the metropolitan area of Dallas, Texas. The development has been restricted against stores and business encroachment of any character.

Three years ago, when it became apparent that a business section was needed, the firm of Fooshee and Cheek was retained to prepare architectural plans for the project.

The village is divided into the following units:

Unit A. Bank and storage vault, drug store, ready-to-wear shops, jewelry store; Junior League club rooms and offices on the second floor.

Unit B. National chain food stores, restaurants.

Unit C. Theater seating 2,000 persons, candy shops, flower stores.

Unit D. Fire station, police station, automobile and furniture display stores.

Unit E. General merchandising stores, drug store, sporting goods, barber shop, and the like; doctors' and dentists' offices and beauty shops on the second floor.

Unit F. Interior street for pedestrian use only, 15 feet wide, cobbled and with steps leading to a fountain in the center of the block; shops for antiques, books, novelties and pottery.

Unit G. Filling stations and automobile supplies.

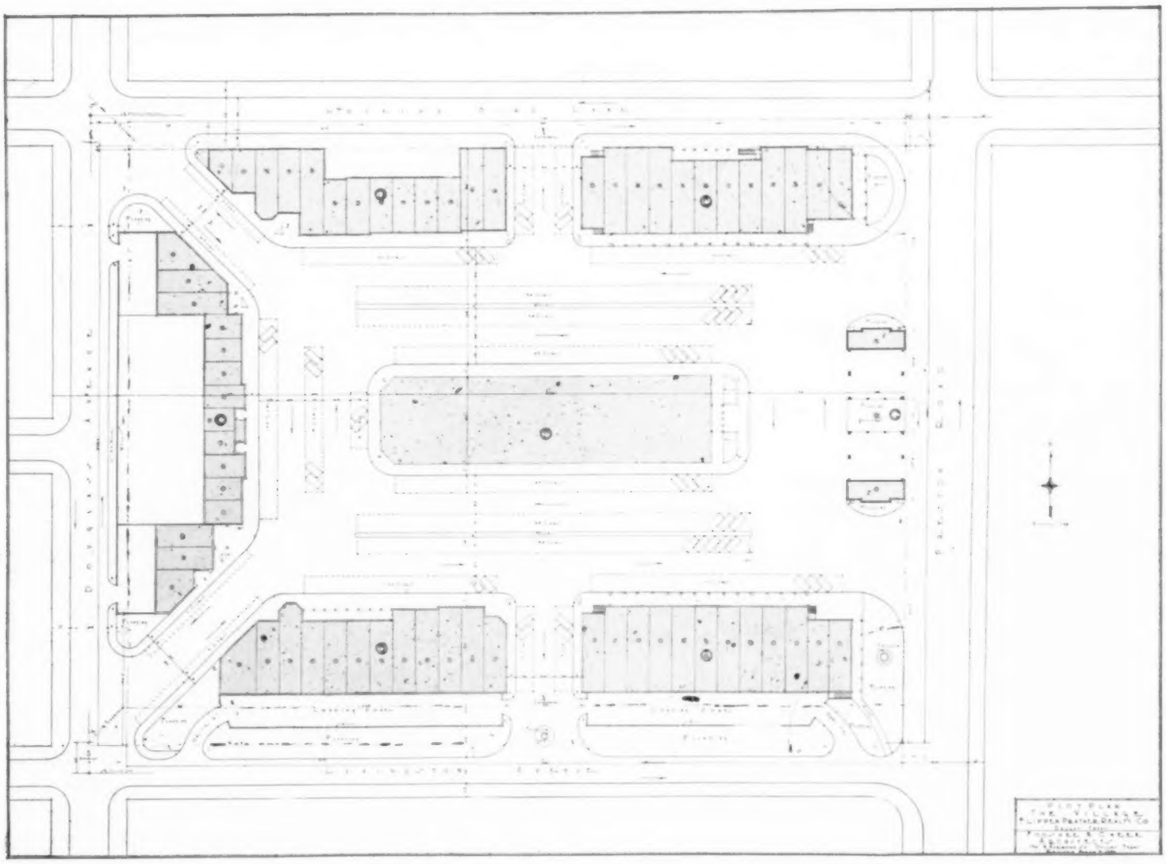
Units B and G are now complete. Plans are in progress for the theater and Unit A. The other groups will be built as leases are closed. Completed buildings will cost in excess of $1,000,000.

Parking space for more than 600 automobiles has been provided inside the plaza. Each trafficway is divided in the middle by a safety zone and has four parking lanes. The cars are parked at a 45 degree angle and traffic moves in one direction. Loading zones are provided at the rear of several units. These loading zones are enclosed by stucco walls, 10 feet high, and the space between the walls and the sidewalk, about 30 feet, is landscaped.

In order to eliminate unsightly signs and advertising displays, the tenants are required, on signing leases, to agree to adopt the standard size signs designed for the village by the architects.

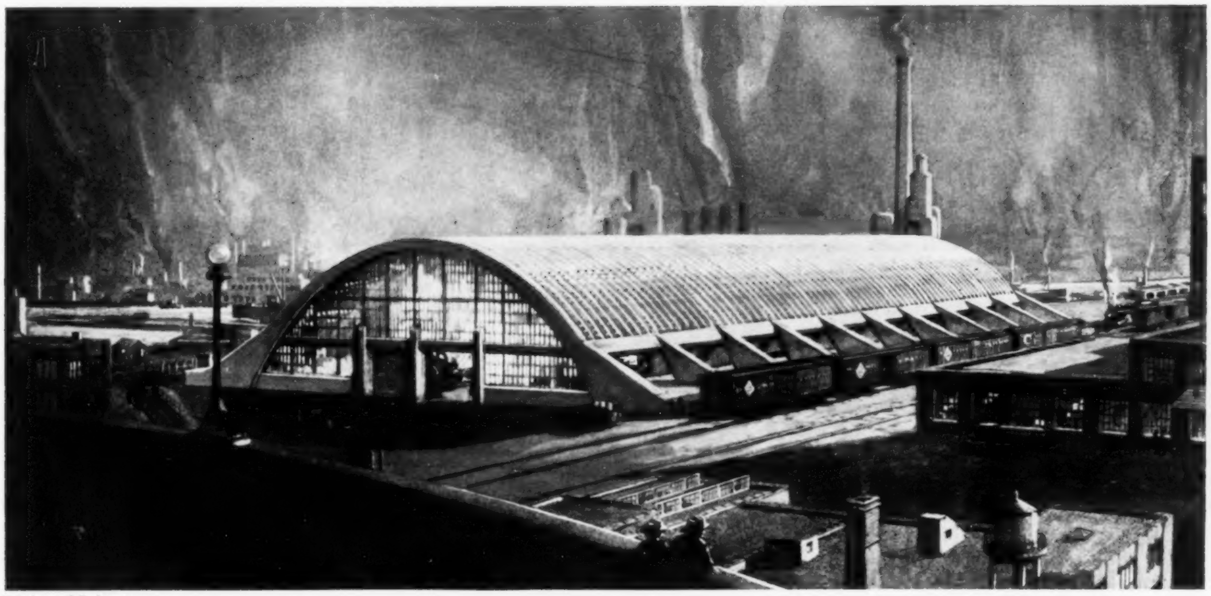
Photographs shown herewith are of a model made to one-quarter inch scale. The model is fabricated of Masonite board covered with plaster of paris and Textone, colored and textured to simulate a stucco surface. The tiled roof effect is obtained by the use of lead sheets, corrugated and painted in reds and browns. The reja grills and iron balconies are made of brass wire dipped in paint. Miniature automobiles in scale are placed on the streets of the model to give a realistic effect. The model, made at a cost of several thousand dollars, was built primarily to help prospective tenants visualize the completed project. It has been a valuable aid to the owners in closing leases.

PHOTOGRAPH OF MODEL



PLOT PLAN

MODEL SHOPPING VILLAGE, DALLAS, TEXAS
FOOSHEE AND CHEEK, ARCHITECTS



Drucker and Baltes Co

A REINFORCED CONCRETE ARCH STRUCTURE

By ARTHUR J. BARZAGHI, Engineer

Many buildings which require large floor areas unencumbered by supporting columns are erected each year. Their construction is usually structural steel unprotected by fireproofing. No serious attempt, however, seems to have been made to produce a thoroughly fireproof structure at a cost competitive with the usual steel structure.

Reinforced concrete has not proved economical because of the high cost of the temporary formwork and the additional time required for construction. Also, it is easier for a contractor to sublet the greater part of the work, thus minimizing his risk and greatly reducing his required working capital.

In the design of reinforced structures true economy can be obtained only by a multiple use of formwork. Efficient design must consider field construction methods which will accomplish this result. In one-story buildings, where the formwork is shifted horizontally, economy of formwork is accompanied usually by slow construction. In arched construction, basically a more economical construction, the problem of minimum formwork and speed of construction can be simultaneously solved by introducing cellular precast units of concrete.

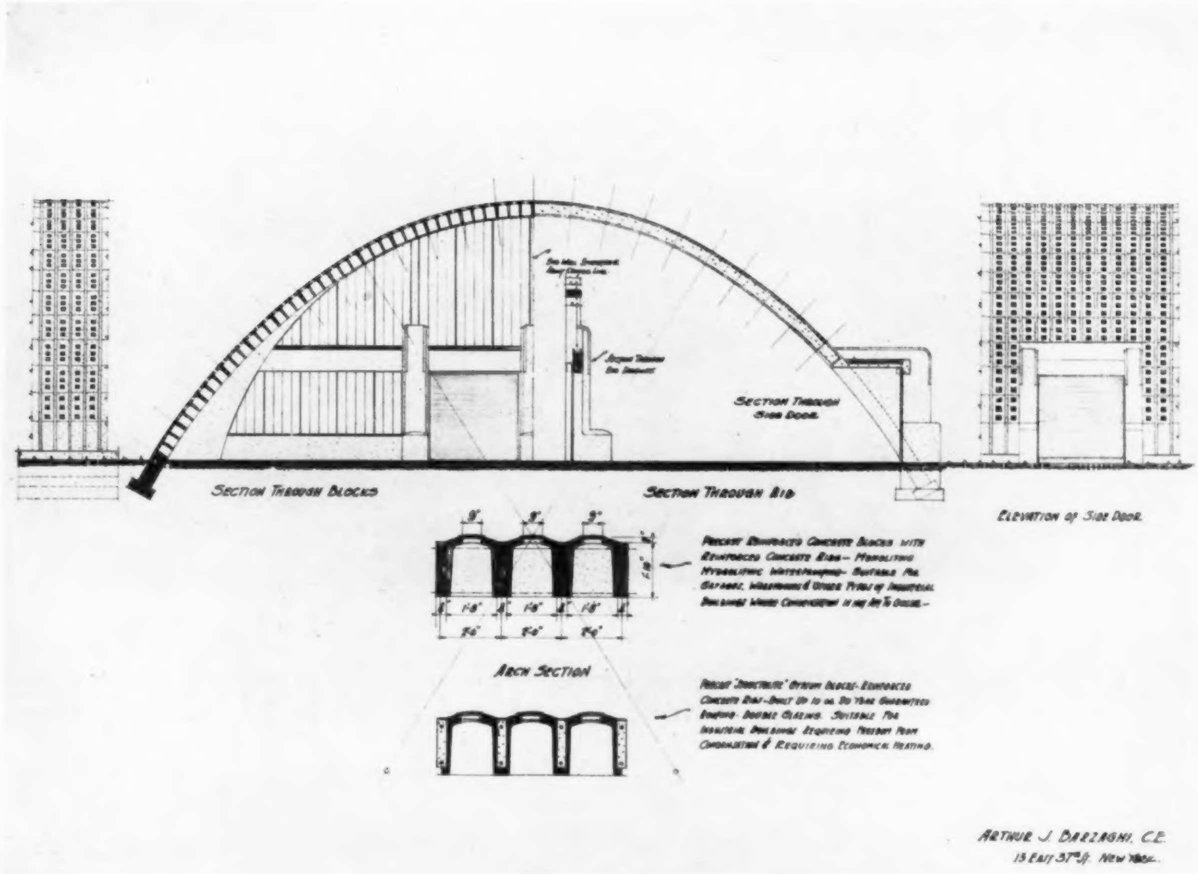
The foundations having been built, a traveling center is erected and on this center are placed the cellular blocks in parallel rows. These blocks are laid with an emulsified asphalt joint; the key, however, is grouted with high early strength mortar. Space is allowed for a reinforced concrete joist to be poured between each row of blocks. As soon as the operation of pouring the joists has been completed, the center can be lowered and shifted ahead for a repetition of the process. Meanwhile, the arch is supported by the cellular blocks and acts as a simple masonry arch. Since it is constructed in the form of an inverted catenary and since eccentric loads can be controlled during construction, the masonry arch will be in equilibrium. The reinforced ribs, when set, furnish resistance to the bending moments in the structure caused by eccentric loads, such as eccentric wind and snow loads. The dead weight of the structure itself has a marked effect on the control of eccentric loads, an advantage which is not so pronounced in the structure designed for lightness.

The problem of field labor is well divided into the following operations:

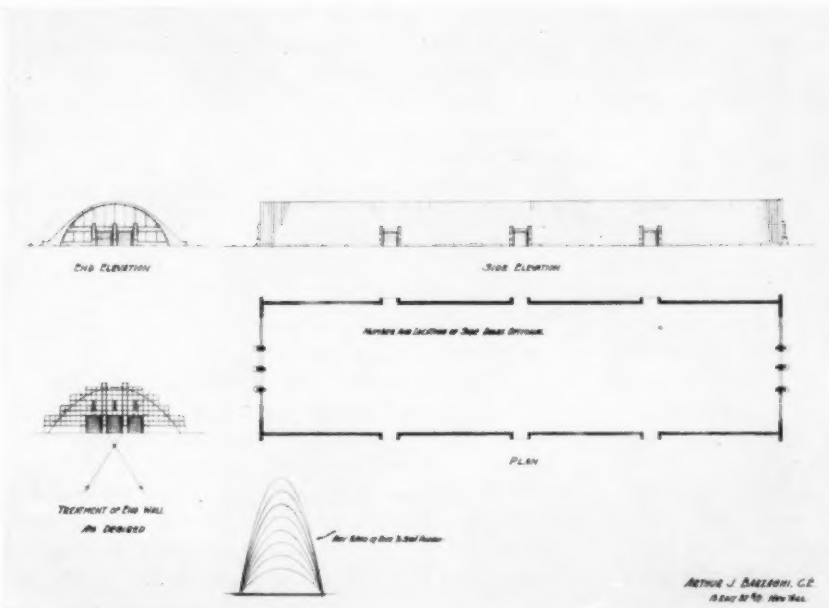
1. Precasting cellular blocks.
2. Setting blocks on center.
3. Pouring reinforced concrete ribs.
4. Lowering and shifting center.

The various operations can be so balanced that a constant construction speed is assured.

Ideal diffused lighting is obtained by inserting prism glass in each cell of the blocks. The deep ribs deflect and diffuse the light rays. In the same way they tend to break up sound waves, thus giving this type of construction good acoustical value.



CONSTRUCTION DETAILS
A REINFORCED CONCRETE ARCH STRUCTURE



Buildings suitable for this type of construction include:

1. Airplane hangars.
2. Airship docks.
3. Enclosed piers and docks.
4. Markets.
5. Railroad passenger terminals.
6. Railroad freight terminals and warehouses.
7. One-story industrial buildings.
8. Auditoriums and gymnasiums.
9. Armories and drill halls.
10. Foundries and rolling mills.
11. Locomotive and boiler shops.
12. Automobile factories.
13. Amusement centers.

TECHNICAL NEWS AND RESEARCH

American-Swedish News Exchange

TOWN HALL AT STOCKHOLM—RAGNAR OSTBERG ARCHITECT

CAN BRICK WALL CONSTRUCTION BE MADE WATERTIGHT?

By DR. F. O. ANDEREGG, Building Consultant
Mellon Institute of Industrial Research

Dampness frequently appears on the inside of brick walls. What materials should be chosen and how should the architect detail the wall construction to overcome such dampness?

This investigation was undertaken by Dr. Anderegg to provide the necessary information. The studies required more than two years of research. In conducting this work Dr. Anderegg and his assistants had the cooperation and advisory aid of a committee of fifteen architects, contractors and brickmasons.

The experimental work, upon which the conclusions have been based, included more than 300 panels, as many brick beams, an experimental house and numerous laboratory tests. The investigation was conducted at the Mellon Institute of Industrial Research, at first in cooperation with the Eastern Face Brick Manufacturers' Association and the Portland Cement Fellowship, and later with the American Face Brick Association.

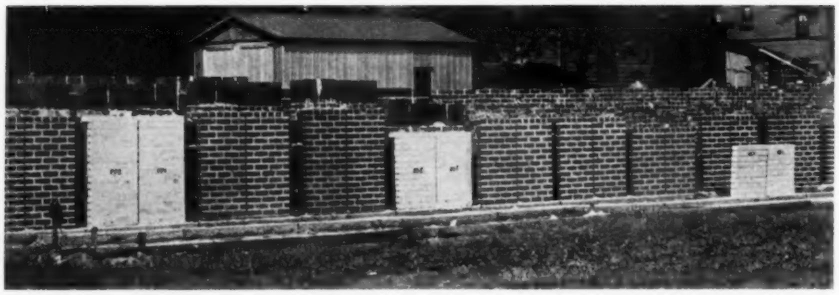


Fig. 1—More than 300 brick panels were erected for investigation.

Fig. 2—Another view of the panels erected in the systematic study of factors affecting brick masonry construction.

SUMMARY OF THE INVESTIGATION

Rain water carrying sulphuric acid—an active medium for the various deteriorating reactions—in the first place, so far as possible, should be prevented from entering the wall and in the second place, if any does get in, should be removed rapidly.

Moisture may enter from the bottom by capillarity, from the top by soaking in through copings or other trim, or through the face of the wall. The first may be prevented by breaking the capillarity and the second by proper flashing. While moisture may enter the face through porous mortar or brick in certain cases, trouble is usually due to the presence of depressions in the mortar surface in contact with the brick, caused apparently by incomplete wetting of the brick by the mortar, or too rapid moisture removal while the mortar is still plastic, or both.

To prevent the formation of such passageways for moisture, the absorption rate of the brick should be controlled. For best results the ten-minute absorption should be between 1% and 3% for summer work and between 3% and 5% for wintertime. With brick of lower absorption rates mortars of low water content are recommended; limes of "low yield" are helpful. Moreover, the mortar should be quite workable in order to aid in securing contact with the brick, and the rate at which moisture leaves the mortar should also be controlled. An adequately distributed stearate waterproofer seems necessary for such control. In addition, certain precautions in laying brick are important: the joints should be about 3/8" in thickness, tapping down being very helpful in securing good contact; head joints should be filled; brick after being once placed should not be disturbed; and the final tool-finishing should wait until the mortar reaches the initial set.

In addition to workability, the important properties of a mortar in securing and maintaining the integrity of the wall include bond strength and durability, watertightness, weather resistance, flexibility, compressive strength, low shrinkage, and freedom from efflorescent salts. To secure these, a proper proportioning of the ingredients in the cement to give a well-balanced combination is necessary. The character of the sand used is important and opportunity exists to improve the grading of most commercial sands in order to secure better workability and greater compactness.

Even with impervious brick and watertight mortar it is not always possible to secure a perfectly tight wall, because of the human element involved in bricklaying. Therefore, for walls or buildings exposed to more severe conditions, provision should be made in design to allow rapid removal of any moisture that does get in. Furring is the best method, but cavity walls, or hollow units which provide continuous vertical openings for ventilation and drainage, may also be employed.

For parapet walls, which seem to get most severe exposure, brick with standard face but with the bed extending the thickness of the wall and provided with holes for ventilation and drainage are recommended, together with flashing just above roof line.

THE BRICK

Face brick are chosen for their color, texture, size and shape necessary to produce the desired architectural effect. At the same time, however, other properties of the brick are important in the wall construction and are usually taken into consideration. These include the hardness of burning, the rate of absorption, and the nature of the surface of the brick exposed to the weather.

Practically all brick offered for sale have been properly burned.

The rate of absorption has a bearing on the choice of mortar and on the method of laying. It may be conveniently determined by placing a weighed, air-dry brick on its bed-side in 1/8" of water for 10 minutes. After wiping off the superficial moisture and weighing, the percentage of increase may be used in placing the brick in one of the following classes:

Table I

Class	*Ten-Minute Absorption*
High absorption	More than 10%
Medium absorption	5% to 10%
Low absorption	1% to 5%
Vitreous	0% to 1%

The rate at which moisture is removed from the mortar by the brick has a marked influence on the bond strength and watertightness of the wall. Examination of the joints in the experimental panels and brick beams, and in numerous buildings where trouble has occurred, has revealed generally the existence of numerous depressions in the surface of the mortar next the brick, through which moisture readily penetrates and which also reduce the bond strength. Either the mortar has not had a chance to wet the surface of the brick or the moisture has been removed so rapidly that shrinkage in certain localized spots has produced valleys; probably both effects are present.

Brick of higher absorption rates should have their excessive sucking power diminished by wetting. The results of numerous experiments with typical mortars indicate that, for best results for summer work, the 10-minute absorption should be in the range 1%–3%, while for winter work it should be higher, say 3%–5%, to compensate for the lowered viscosity of water. When brick of lower absorption rates are used, special precautions as to choice of mortar should be made, as outlined later.

The surface characteristics of the brick need some consideration. A glazed brick keeps the water out; but if moisture does get in through imperfections in workmanship or between the mortar and brick, the chance for its evaporation is limited. In other words, the wall has poor breathing capacity. On the other hand, if brick with porous surfaces are used, moisture readily goes in and then out again. Because of the sulphuric acid in rain water, especially in winter and in districts where much coal is burned, moisture should be kept out of the wall just as much as is practicable and when it does get in it should be removed as quickly as possible.

THE MORTAR

A survey of present practice has revealed a wide variation in mortar quality. Some mortars are on a par with the mud used by the pioneers. But others have tried to get a good job by using straight portland cement-sand mixes, apparently judging the quality of the mortar by the tensile strength of specimens made in nonabsorbent molds. Somewhere between these extremes should lie a happy medium.

In this article there is presented for the first time a complete analysis of the desirable properties in masonry cements. The part played by the sand in producing quality work has also been demonstrated as well as the importance of the presence of a properly distributed stearate waterproofer. As a result, it is now possible to design scientifically masonry cements and mortars for any given set of conditions.

Qualifications of a Well-Balanced Masonry Cement

Important properties in a masonry cement include the following:

(1) The *workability* of the cement is important because it aids in securing contact with the brick and in the quality, neatness and speed of the work. The sand-carrying capacity has a bearing on the cost and shrinkage of the mortar.

(2) The *strength of the bond* between the mortar and the brick is of importance as this is usually the weakest point in the wall.

(3) At the same time it is desirable to have a *watertight* bond. Most of the leakage that occurs in buildings is between the brick and mortar. To avoid

Fig. 3—Experimental house erected to study the effects of different hollow wall designs.

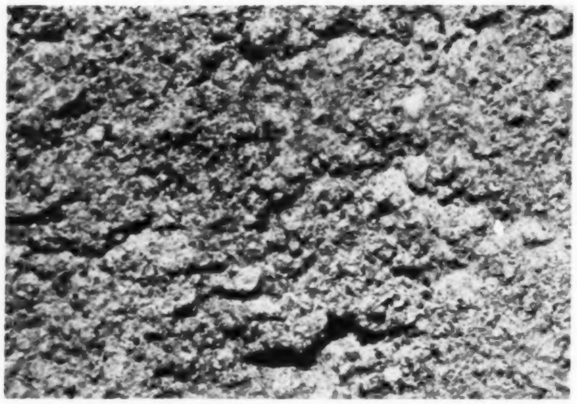


Fig. 4—This photograph shows the surface of mortar in contact with the brick in a leaking wall. Moisture penetrates readily through the depressions in the mortar caused either by incomplete wetting of the brick or by partial shrinkage of the mortar, or both. This effect is most readily prevented by properly distributed stearate in the mortar.

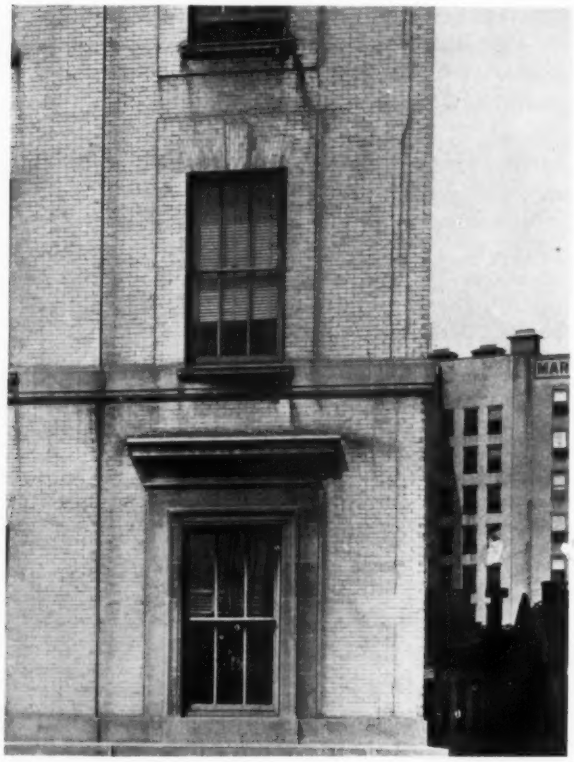


Fig. 5—Brick masonry laid with inflexible mortar. Water, probably collecting in poorly filled head joints, has frozen and expanded, breaking the brick underneath. Repetition of the freezing has resulted in long vertical cracks. This effect is an argument for providing for rapid removal of moisture in such a wall. The disintegration of the mortar immediately beneath the stone window sills indicates the desirability of flashing.

this trouble, the mortar must wet the surface of the brick thoroughly and then the rate at which moisture leaves the mortar must be so controlled as to prevent the development of shrinkage depressions while the mortar is still plastic (see Fig. 4).

(4) The *compressive strength* of most mortars is adequate.

(5) Nevertheless, as this strength gives some evidence as to the probable *weather resistance* of the mortar, low strengths should not be permitted. Mortars, especially those in chimneys, parapet walls and in similar exposed positions, should be adequately weather resistant.

(6) The *flexibility* of the mortar is a property that has too often escaped attention. The mortar should have sufficient resilience to take up the movements of buildings, especially of high towers and chimneys, due to temperature changes or wind gusts, or those pressures resulting from the freezing of moisture in poorly filled head joints. One New York building has cracks extending vertically for 50 feet (see Fig. 5), probably caused by such freezing.

(7) The cementing material should contain no more than traces of *efflorescent* materials and a mortar low in absorption is desired so that efflorescence-producing rain water should have little opportunity to enter.

(8) The *fading* of colored mortars can usually be prevented by proper waterproofing, although some black and yellow pigments are so poorly bonded that they soon fall out.

Waterproofing

The results obtained in this research and in previous investigations[1] have demonstrated repeatedly the superior results that can be obtained with properly distributed stearate waterproofer. The advantages have been found to be:

(1) Improved workability.

(2) Better wetting of the brick surface.

(3) Prevention of shrinkage openings between brick and mortar by controlling the rate at which moisture is absorbed from the mortar.

(4) Increased weather resistance by lowering the absorption.

(5) Improvement in the flexibility of a mortar.

The disadvantages of using a waterproofer include a small reduction in compressive strength, a slight increase in cost and some water-repellency on mixing. The first effect is negligible in comparison to the improvements in the other properties. The increase in cost will range from \$.20 to \$.50 per thousand brick, but this would be compensated by a 1% increase in speed of erection, readily securable with the increased workability and by the greatly improved quality of the job. The water-

[1] Anderegg, Peffer, Judy and Huber: *Purdue Univ. Eng. Exp. Sta. Bull.* 33, 1928. Also, unpublished results with stuccoes.

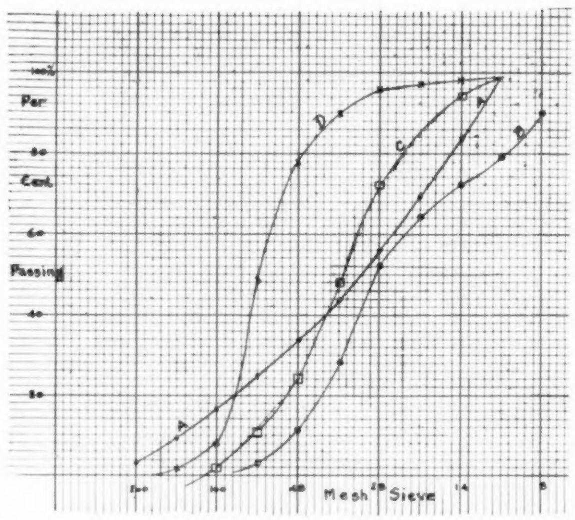


Fig. 6—The grading of aggregates. A is the ideal for mortar. B is a very harsh sand requiring too much cementing material to fill the voids. C is the grading curve for a finer river sand, typical of many. D represents a lake sand with most of the particles occurring in a narrow size range.

repellency is overcome readily by wetting the sand before adding the cement.

Mortar Aggregates

Commercial sands differ widely in their grading, so that mortars made from them vary considerably in workability and weather resistance. The ideal grading of sand for mortar has been worked out[1] and is such that, when separated with standard sieves differing in mesh dimensions by the factor 2 (8, 14, 28, 48, 100 mesh), each fraction should be about 1.2 times that separated on the next smaller sieve. This grading gives a highly workable mortar with good strength and weather resistance, while the absorption is low because of the small water requirement.

The curve for the ideal grading has been plotted in Fig. 6 as A. Curve B represents a harsh, coarse river sand (Allegheny), Curve C is a finer river sand, while D is a typical lake sand. Sands B and C contain an excess of material passing the 28-mesh but caught on the 48-mesh sieve; this is characteristic of most commercial sands. Sand D is one step finer. With sand A, 28-day compressive strengths as high as four times those obtained with sand D have actually been secured, indicating the possibilities in more careful grading of the aggregate. Sands B and D might be combined to good advantage, using about 2 parts of the former with one of the latter.

The crushed stone manufacturers are the logical place to look for help in supplying deficiencies in commercial sands. They usually have an excess of fine materials and often during their handling of these fines, as in the production of limestone for agriculture and for glass, material suitable for supplementing the grading of commercial sands can be obtained easily and economically. The harsher the sand, or the greater the water requirement of mortar made from a given sand, the better the opportunity of rendering a real service to the building industry. The increase in sticking power brought about by the addition of fine limestone of proper size is shown in Fig. 7.

Experimental Results

In the study of different mixes of portland cement and lime and of masonry cements, numerous panels and brick beams have been erected by practical brick masons. It has been found possible to direct competent brick masons so that results can be obtained at least as concordant as those from different testing laboratories for tensile strengths. Many of the beams and panels have been broken in flexure and some of the results obtained with beams are given in Table II.

After the beams were broken, triplicate pieces of mortar, 4″ square and 0.5″ thick, were detached, soaked in water overnight and weighed. They were then stored in a small cabinet with a relative humidity close to 75%. After six days, they were weighed again to give the "absorption" values in the table, which are averaged from the three specimens.

The conclusions obtained from this and other sets of experiments follow:

The greater the amount of portland cement, the greater the compressive strength, values ranging from 200 pounds per square inch for pure lime mortars to nearly 5000 pounds for straight cement mortar having been obtained. The flexural or bond strength does not increase nearly so fast, the modulus

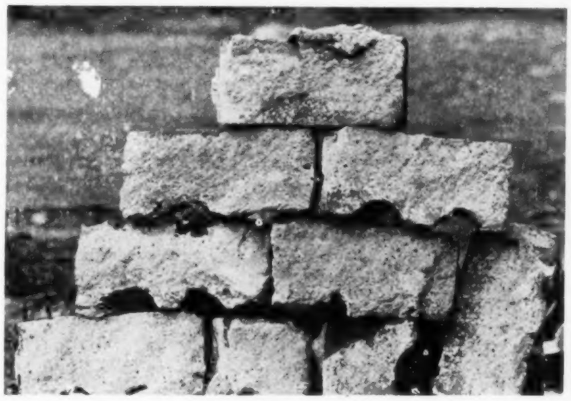


Fig. 7—Mortar made from equal volumes of cement, lime and limestone with five volumes of very harsh sand. The limestone has effected a considerable improvement in mortar quality, especially in adhesion and in flexibility.

[1] Anderegg, F.O.: "The Grading of Aggregates II: Application of Mathematical Principles to Mortars," to be published in *Ind. Eng. Chem.*

of rupture ranging from about 15 to 100 pounds per square inch. However, the high cement mortars are brittle, being readily detached from the brick by impact. High lime mortars, on the other hand, are much more flexible and seem to undergo a tearing action under load, indicating some ability to adjust themselves to stresses.

The high lime mortars are more absorbent than those containing more cement, so that they are less weather-resistant.

The high lime mortars are much more workable and have better sand-carrying capacity than those containing more cement.

Under present conditions of bricklaying, the best assurance of getting a watertight joint between the mortar and the brick lies in the use of a properly distributed stearate waterproofer, either ammonium stearate paste added to the mixing water or a cement containing integrally ground stearate.

Table III has been worked out for mixes to be used with different brick under different conditions. The narrow joints average 3/8″, the wide joints more than 1/2″; the former are certainly to be preferred.

For dry brick with high absorption rates use "high yield" lime; for vitreous brick "low yield."

Where the sand used is so harsh that satisfactory workability cannot be secured with the mixes recommended, it is suggested that limestone crushed from clean stone and having a residue of 15% to 25% on the 48-mesh sieve with about 10% passing a 200-mesh sieve be added to the sand according to the harshness, but never in excess of 15%.

Mortars for Pointing

The vertical joints in all trim, especially window sills and copings, require very careful pointing. The mortar used should not be richer than 1:2.5 and might well be the same as used in the joint. The mortar should be flexible and waterproofed and, when feasible, should contain a small amount of fine limestone as recommended above. For repointings, or for pointing where the joints are not filled initially, the mortar should be mixed at least two hours before using and then, of course, must be reworked, whereby the workability is greatly improved and much of the initial shrinkage is eliminated.[1] The joints should be raked out to a depth of about 3/4″ and well wetted. The mortar should then be packed in tightly and left until it stiffens appreciably (about the point of the so-called initial set) and finally tool finished with a strong pressure.

[1] Experiments conducted by Gonnerman and Woodworth ("Tests of Retempered Concrete,") *Proc. Am. Concrete Inst.*, 29, 344 (1929) have shown that portland cement mortars may be retempered up to the age of six hours without being appreciably hurt. One advantage of remixing is that much of the initial shrinkage has taken place; and if the final pointing is done at the proper point in the setting process, still more of the effect of the initial shrinkage may be avoided with considerable improvement to the integrity of the joint. This does not necessarily hold for all *masonry* cements.

Table II

FLEXURAL STRENGTH OF BRICK BEAMS, BUILT AND STORED INDOORS

Modulus of Rupture in Pounds per Square Inch, Averages of Two or Three Cement-Lime Mixtures. Volumes of Cement: Lime Putty: Sand (Cow Bay)

Brick	Brick 10 min. Absorption %	2:1:6 Mortar		1:1:5 Mortar		1:2:9 Mortar	
		St'gth Lbs. Sq. In.	Absorption %	St'gth Lbs. Sq. In.	Absorption %	St'gth Lbs. Sq. In.	Absorption %
A dipped	8	15	5.9	37	6.0	25	8.0
B dipped	5.5	36	4.5	50	6.8	35	9.6
C	1.4	53	4.2	36	7.0	43	8.4
D	3	67	6.1	55	9.1	33	10.5
E Full joint	0.6	54	4.3	52	6.9	47	9.0
E Furrowed joint	0.6	78	5.0	50	7.0	41	9.2
Average		51	5.0	47	7.1	37	9.1

Masonry Cements (All with Brick D)

Cement			*Mortar Absorption %*
B	24	1:3	6
C	31		7.8
D	36		...
EW	46		8.3
F	41		...
G	20		...
H	16		8.1
Avg.	31		7.6

Table III

MORTAR MIXES SUGGESTED FOR DIFFERENT CONDITIONS

Mix—Cement: Lime: Sand by Volume

Cement: 94 lb. per cu. ft.

Lime: 7–8 cu. ft. putty per bbl. of quicklime or 4–5 cu. ft. putty per bbl. of hydrate.

Sand: 80–85 lb. per cu. ft. loose and moist.

Absorption Rate (10 min.)	Summer		Winter (below 40° F.)	
	Narrow Joint	Wide Joint	Narrow Joint	Wide Joint
High, above 10%	1:2 :9	1:1.5:7.5	1:1.6	1.5:1:7
Medium, 5–10%	1:1.5:7.5	1:1 :6	1.5:1:7	1.5:1:7
Low, 1–5%	1:1 :6	1:1 :6	1.5:1:7	2:1:8
Vitreous, 0–1%	1:1 :6	1.5:1 :7	1.5:1:7	2:1:8

WORKMANSHIP

The factor of workmanship seems to be the most important in brickwork, both in the cost and in the integrity of the wall. The bricklayer may be a highly skilled artisan, who takes pride in turning out high class work, but under the best of conditions a really perfect piece of brickwork is rare. The contractor shares the responsibility with the mason because he hires the mason and usually indicates what kind of workmanship is desired on the job. Most contractors desire to do good work, but the economic necessity of getting a reasonable number of brick laid during the day, combined with a dearth of standards as to what constitutes proper bricklaying, has resulted in the use by many brick masons of more or less faulty technique from which they depart only with considerable mental effort.

Certain phases of workmanship have been systematically studied by the erection of panels, including different degrees of joint filling, the tapping back of the brick into plumb, tool-finishing and joint thickness. The mortars used in the workability experiments were rather high in cement (either 1:3 with 10% of lime or 2 volumes of cement to 1 of lime and about 7 of sand) and were not waterproofed. Furrowed joints were also experimented with. The test was made by spraying, which showed in a very satisfactory manner the weak points in the wall.

As a result of these studies it was concluded that all head joints should be filled with mortar, but the evidence in favor of filling the bed joints was hardly sufficiently clear-cut to warrant its recommendation in view of the extra cost involved.

The undesirability of tapping brick back into place was conclusively demonstrated, even with a mortar that gives a tight, non-leaking bond with brick; the chances of getting a sealed joint if the brick is tapped back, are greatly reduced.

Tool Finishing of Joints

The finishing methods included scoring or simply scraping off the excess mortar, ordinary pointing to give a struck joint, weather pointing, finishing with a rounded tool and raking.

The tool finishing of the joint, after the mortar has stiffened to the point where it will hold its shape, is recommended, because it brings the mortar into intimate contact with both brick (see Fig. 8). Pointing while the mortar is soft is apt to cause the wall to curl outward (see Fig. 9).

A careful tooling of the joint is sometimes literally the final touch needed to make the joint watertight. Cases have been known where identical conditions of bricklaying prevailed in the same building, but the joints were part scored and part pointed with a round tool. The former leaked, while the latter did not, in spite of similar exposure.

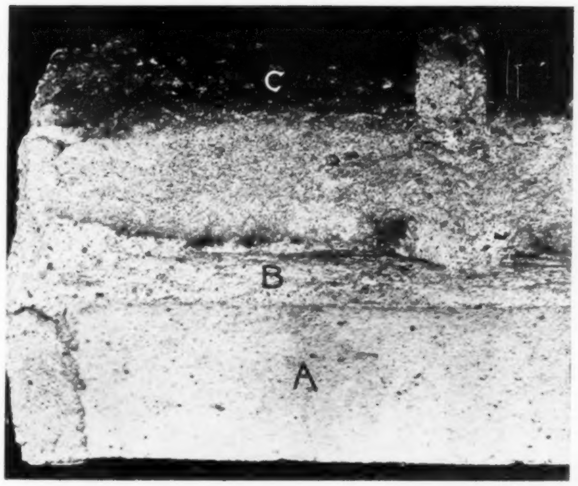


Fig. 8—The effect of tool-finishing. Both sides of the panel from which this brick (A) was taken were exposed to the weather. The mortar surface (B) in the foreground was tool-finished, the other not. Note the penetration of grime (C) between the brick and mortar from the back. Moisture penetrates still more readily.

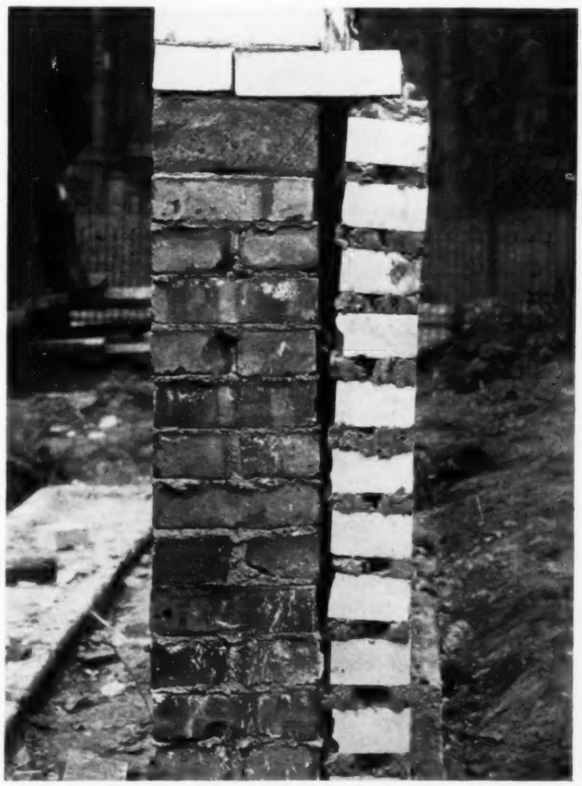


Fig. 9—An exaggerated example of what may happen by tooling mortar while still soft. The thick mortar joints, deeply furrowed between vitreous brick, have given an unusual combination, but the same thing is observed to a less extent in many other jobs.

Table IV—PERCENTAGE VOLUME CHANGES IN MASONRY AND MORTARS OF DIFFERENT JOINT WIDTHS

Averages of Six Panels—Mortar 1:1:3

Joint Width Inch	Brick	Initial Shrinkage		Wall Mortar Change on Spraying	Wall Mortar August, 1929 to April, 1930	Wall Mortar August, 1929 to July, 1930
		Whole Wall	Mortar			
1	A	0.017	(.064)	0.004(.015)	0.034(.128)	0.036(.136)
1	B	0.069	(.260)	.004(.015)	.044(.166)	.048(.181)
1	F	0.043	(.162)	.001(.004)	.065(.245)	.056(.211)
3/4	A	0.007	(.033)	−.003(.014)	....	.026(.121)
3/4	B	0.003	(.014)	−.007(.033)	.030(.168)	.016(.075)
3/4	F	0.003	(.014)	.006(.028)	.026(.121)	.030(.140)
1/2	A	0.010	(.065)	.003(.019)	.014(.091)	.009(.059)
1/2	B	0.009	(.058)	.004(.026)	.017(.110)	.012(.078)
1/2	F	0.009	(.058)	.001(.007)	.018(.117)	.019(.123)
3/8	A	0.021	(.161)	.000(.000)	.012(.092)	.001(.008)
3/8	B	0.022	(.168)	.002(.015)	.013(.100)	.009(.069)
3/8	F	0.012	(.092)	.000(.000)	.007(.054)	.001(.008)

Joint Width

A joint width of about 3/8″ is recommended in view of the results obtained with a large number of panels. It is felt, however, that joints thinner than 1/4″ are usually not advisable; for unless very plastic mortar is available, a high degree of skill is required to get the mortar spread sufficiently even to seal the joints completely.

Six panels each were built with joint widths 1″, 3/4″, 1/2″ and 3/8″. In half the panels the bed joints were completely filled; in the other half the mortar was furrowed deeply. Three types of brick were used, having, respectively, very low, high and very high absorption rates. On spraying, or during rainstorms, the moisture penetrated readily through the 1″ or 3/4″ joints, whether furrowed or not. Observation was made by detaching brick and noting the pathway of the moisture, which again was found to be through depressions between the mortar and the brick.

Where the 1/2″ joint was used, the passage of moisture was somewhat reduced; and with a joint width reduced to 3/8″, having been obtained by tapping, no evidence of penetration of moisture was found through the bed joints (see Fig. 10). Moreover, the thin joint panels withstood considerable rough handling.

Inserts were placed in these panels so that changes in volume could be followed with a 20″ strain gauge. The first readings were made as soon as the mortar was sufficiently hard to bear the application of the gauge. Readings were then taken at increasing intervals, giving some indication of the initial shrinkage and of other volume changes. The results are summarized in the accompanying table. The values in parentheses are calculated for the mortar alone, assuming no changes in the brick.

The volume changes vary with the amount of mortar in the brickwork and seem to be slightly greater, relative to the amount of mortar, in the 1″ joints.

On spraying, the volume changes observed were very small, averaging about three parts in a hundred thousand. The same was true of the effect of a 24-hour driving rainstorm. It is suggested that one of the causes for the small effect noted was that cooling offset expansion caused by wetting. Another is the fact, first reported by Davis and Troxell,[1] that mortars in contact with absorbent materials have different volume change properties from mortar specimens prepared in metal molds.

The growth over the seven months period from the end of August, 1929 to early April, 1930, was appreciable. The swelling of the dolomitic lime as observed by Davis and Troxell,[1] probably explains the larger part of this phenomenon.

Mortar Mixing

The mortar should be thoroughly mixed to give the mason a material with which he can get an even bed of mortar. This point of view leads to the recommendation of machine-mixed mortar. The well recognized superiority of the batch mixer over the continuous mixers induces a recommendation in favor of the former. The importance of using only properly slacked lime should also be emphasized.

[1] Davis and Troxell: "Volumetric changes in Portland Cement Mortars and Concretes," *Proc. Am. Concrete Inst.*, 25, 210–55 (1929).

DESIGN

The design of the wall may be defined as the choice and arrangement of building materials to secure a properly balanced combination of architectural appearance, strength, watertightness, insulation against heat and cold, protection against fire, low weight, sound absorption, and long life, all to be secured at reasonable cost. The architect should be provided with sufficient information so that he may specify in such a way that, even if materials or workmanship are not completely perfect, he can be sure of securing the desired results.

Walls with overhanging eaves seldom suffer from damp interiors. But where walls of brick, or of any other material economically available at present, are subject to the severe exposure of prolonged driving rains, such as occur along the Atlantic seacoast, special precautions in design are necessary.

The steps leading logically to the conclusion presented here were as follows: first, many bricks will allow the passage of no more than a trace of moisture; secondly, a practically watertight mortar may be secured, but, unless the workmanship is perfect, moisture is apt to penetrate the wall through imperfections in the joints, where exposure to a driving rain is sufficiently prolonged. The solution of the problem is the inclusion of an air space, such as is provided by furring, which will drain off through suitable weep holes any water coming through. The air space also helps the internal ventilation of the wall and improves the heat insulation. In the first place rain water should be kept out of the wall as completely as possible and in the second place provision should be made to get rid as quickly as possible of any moisture entering the wall.

Support for this conclusion was found in the observation that those panels built with backing separated from the face and those built with a special double brick with vertical openings did not leak even on prolonged spraying.

Fig. 10—Panels laid with narrow joints of $\frac{3}{8}''$ have given much better results than thicker joints. The contact with the mortar was much better and the volume changes were appreciably less.

Fig. 11—An example of an open-structure, non-leaking wall. The bond is double Flemish with no mortar between the stretchers. When the gutter became corroded, moisture soaked down into the wall and out as indicated by the arrows. The acid brought in by the rain water has produced some efflorescence.

Another method having some supporters is to build the sponge-like wall[1] of porous brick and mortar which will hold a large amount of rain and allow it to evaporate readily from the surface. The objections are that, unless capillarity is broken, moisture is bound to penetrate the entire wall during a continued driving rain, and rain water brings acid into the wall, which means an accumulation of efflorescent salts.

Again, bituminous dams are sometimes placed on the backs of walls. The position is wrong mechanically, since the dams, being plastic, are broken through wherever a small head of water accumulates within the wall.

Another method is to include systematically within the wall continuous passageways through the mortar. Instances are known where such have been accidental (see Fig. 11). This method can be made reasonably effective, but it also allows contact of acid rain water with the more porous backing.

[1] Kreuger, H.: "Investigation of Climatic Action on the Exterior of Buildings," *Inghiors Ventenspake Akadamun*, No. 24, pp. 68–81, 92–103 (1923). The sponge type of wall is advocated, as a result of observations in Sweden.

EXPERIMENTAL HOUSE

To furnish additional information about air spaces within the wall, an experimental house was built, 6′ x 30′ in size, with one wall 6′ high and the other 8′. It contained 11 panels of varying designs, which have been tested for watertightness, heat flow and air infiltration. The walls were about 12″ thick and included the following specifications:

Panel No. 1. Solid joints, all joints filled solid.
2. Joints back of the face about one-third filled with mortar.
3. Air space 2″ next outside, vented outward, hidden headers, weep holes.
4. Air space 2″ next inside, vented outward; "Ideal" construction, joints between face and first back-up coarse slushed full, weep holes vented outward.
5. Double air space, "Ideal" construction, air circulation, weep holes, no vent at top.
6. Brick G backed by one common brick, vented outward, weep holes, wall ties.
7. Partition tile between face and common brick, vented outward.
8. Air space 4″ in middle filled with sized crushed coke of about 50 pounds per cubic foot, vented outward.
9. Cinder block between face and common brick, vented outward.
10. Air space 4″ with solid partitions at intervals, vented inward.
11. Wood studs, covered with Steeltex inside and out; plaster inside, brick veneer outside with about ¾″ of mortar slushed between brick and Steeltex so that part of the wires of the latter are embedded.

The hollow spaces were kept free from mortar according to a method used in Scotland, which consisted in attaching two wires to a piece of board of suitable size and raising it periodically as headers were put across. The mortar was composed of half a bag of lime to one of cement with four volumes of the same sand used for most of the other panels. This mortar gave fairly good results for winter work, especially when gauged with warm water, except for the presence of passageways between the mortar and the brick.

Heat Conductivity: Determined with the aid of Nichols heat meters[1]. The best results were obtained with panel 11, a brick veneer wall of special construction as explained above, the next best with the panel built of brick G backed with common brick.

The *A. S. H. V. E. "Guide"*[1] value U for a 12″ brick wall, 0.294, lies between the values for panels 1 and 2. The amount of mortar in the joints obviously affects the results. It must be remembered that the heat flowing through windows and roofs is often much greater than through the walls.

Table V

Heat Flow of Panels in Experimental House

B.T.U. Per Square Foot Per Hour Per Degree (F.) Difference

Panel	C Transmission through wall	U Total heat lost air to air
1	0.68	0.33
2	.56	.28
3	.49	.27
4	.55	.28
5	.43	.25
6	0.417	0.240
7	.486	.275
8	.484	.266
9	.446	.249
10	.596	.283
11	.541	.216

Condensation: Heat was supplied to the house by means of open gas flames, which produced large amounts of moisture condensing during cold weather on panel 1, where the masonry was built solid, and on the ends of the headers coming in contact with the inner air.

Moisture Transmission: Panels 1 and 2, up to an age of four months, on spraying permitted moisture to pass in about two hours. The passage occurred again between the mortar and the brick. Panels 3, 6, 8 and 11 were tight, but the others allowed moisture to penetrate along the headers, again through depressions in the mortar in contact with the brick. These experimental results confirm numerous observations on buildings exposed to driving rainstorms.

Air Infiltration: The amount of air passing the ten unplastered brick panels at a pressure corresponding to that of a wind traveling 40 miles per

[1] Loaned by Mr. Haughton, Director of the Research Laboratory of the American Society of Heating and Ventilating Engineers at the Pittsburgh Station of the Bureau of Mines. Grateful acknowledgment is made for this cooperation. The results were integrated from runs lasting at least 48 hours.

[1] American Society of Heating and Ventilating Engineers *"Guide" A.S.H.V.E.* 1930, chap. 2.

Fig. 12—A parapet wall was "protected" by painting the back with bituminous material. The effect was to prevent evaporation from the back and to allow the growth of large crystals of calcium sulphate resulting from acid rain water reacting with lime in the mortar. The crystal pressure resulting, doubtless aided by freezing, has pushed off the coating and has badly disintegrated the mortar.

hour was about 1 cubic foot of air per square foot in 108 minutes. With a hard finish plaster, as in panel 11, only a minute trace came through at this velocity.

Ventilation: The air spaces in these several panels allowed *rapid* evaporation of moisture getting into the wall through the face—a very desirable feature.

In addition to furring, hollow spaces within the wall may be secured in a variety of ways. Hollow tile set with the webs vertically, cement blocks made of various aggregates with vertical cells, brick with standard exposed faces but with beds extending back into the wall and provided with large holes, in addition to the regular cavity wall so often used in Europe, are suitable for this purpose.

Parapet Walls: One of the most vulnerable parts of present-day structures is the parapet wall. Observation shows that moisture, whether by freezing or by promoting efflorescent disintegration, has brought about the destruction of many parapet walls. Therefore, the logical remedy is the exclusion of moisture as far as practicable and provision for the rapid removal of any that does get in. Most methods used have tried to exclude the moisture; but the means used for this purpose have generally resulted in the retention, often for long periods, of the moisture that does get in; the coating of a parapet wall with bituminous or other applications has often merely accelerated the disintegration (Fig. 12).

The building of a hollow parapet wall seemed to be the logical way of handling the situation. So three panels were built containing air spaces in the middle. These were kept saturated during the cold weather of the winter of 1929-30 without perceptible damage, whereas other panels so treated were affected by freezing.

It is recommended that parapet walls be built hollow of special brick (Fig. 13), whose bed extends the full thickness of the wall but whose face maintains the same standard exposure as the other brick in the building. Then the wall should be flashed through, just above the roof line, with weep holes opening on the roof side. At the same time, flashing under the coping, while desirable, is not so essential as where the parapet wall is built solid.

Copings, Window Sills, Belt Courses and Other Trim: Certain precautions are necessary in the application of the trim to the brick wall in order to make sure that moisture does not get into the wall through the trim and to prevent griming of the brick masonry through improper design.

Copings, window sills, and projecting belt courses come in much greater contact with rain and snow than does the vertical face of the wall, so that opportunity for moisture to get in is greater, requiring special precautions. If the material used for trim is not impervious to moisture, or if the joints cannot be made tight, it is necessary to separate the trim from the masonry with suitable flashing. If brick trim is used, the large number of joints increases the danger, hence the need for flashing.

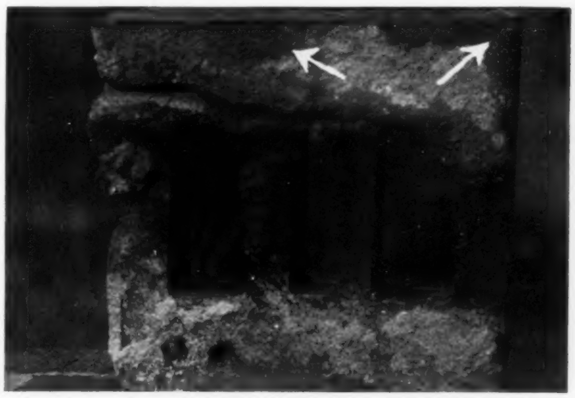


Fig. 13—A brick with a face of standard dimensions but extending back into the wall. On spraying a panel of this brick, the moisture entered between the mortar and the brick as far as the openings where it ran down. These openings allow rapid elimination of moisture by drainage and ventilation. The arrows point to the moisture which has penetrated.

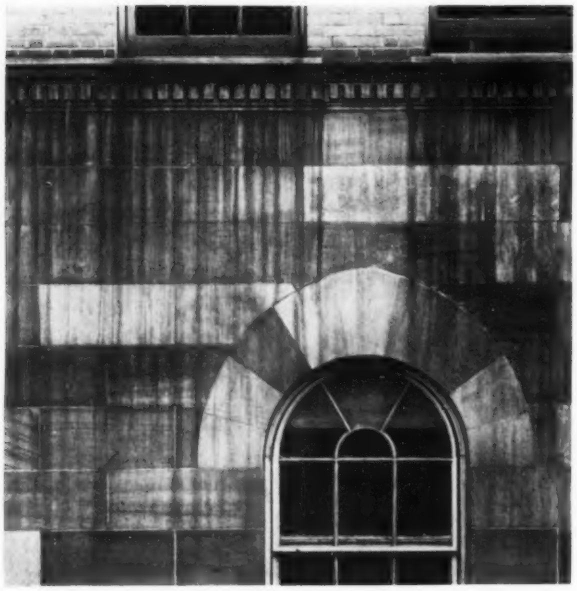


Fig. 14—A drip should be provided beneath all horizontal surfaces to prevent the griming that is defacing this wall.

Soot and dust collect on horizontal surfaces during dry weather and are washed off by heavy rains. Therefore, it is important that such trim with horizontal face project for at least an inch and a half and be provided with a drip having a radius of at least 3/8" (Fig. 14).

Flashing: Moisture penetration into the brick wall through the materials used for trim is common (Figs. 4, 15 and 16) and should be guarded against by providing a suitably impervious membrane to seal out the water. Under copings and window sills, especially, it is desirable to provide flashing, and wherever porous natural or cast stone are used protection is needed. The spandrel beams of all buildings subject to driving rainstorms need to be protected with a suitable waterproofing treatment.

A number of materials are used for flashing, including the following:

Copper, which is available in sheets provided with mechanical keys to hold mortar, is easily handled and gives good bond with the mortar. To test the adequacy of such keys, panels were built without furring, with plain copper and with interlocking

Fig. 15—The protection of the upper part of the wall by flashing beneath the coping has been helpful in preventing efflorescence. Similar flashing below the natural stone belt course would have been desirable.

copper, furring and broken in flexure. The moduli of rupture were 36, 9 and 27 pounds per square inch, respectively, indicating effective keying by the last.

Lead and *aluminum* require protection against the alkalies in fresh mortar.

Impregnated fabrics are inexpensive. Coal-tar products will give better results than asphalts. More experience is needed as to their effective life.

Troweled-on mortar, when made with well-graded sand and adequately waterproofed (stearate) in a 1:1:6 mix, will give satisfactory results if properly applied by high-grade workmen.

Roofing and Gutters: Some trouble has been experienced with brick walls as a result of improper design at the edge of the roof. Again, materials for downspouts and gutters of poor resistance against the acid winter rains are very frequently used, and after the metal has disintegrated, the walls are soaked with rain water, effloresce and disintegrate.

One condition of severe test for the gutter design occurs when a heavy snow falls, followed by a period of cold weather. Heat coming through the roof melts the snow on the underside and the water may run over the metal of the gutter, which is extended up under the roofing, and soak into the wall (Fig. 17).

Sometimes the interstices between slates at the edge of the roof permit considerable amounts of water to enter the wall until filled with mortar or plastic caulking compounds.

Brick Veneer: Occasionally a brick veneered house is subject to more or less severe exposure, and if crevices are left in the mortar joints, a driving rain will penetrate through the wall and run down in the air space, usually left between the brick and the sheeting, until it comes to a window frame. As a precaution, flashing should be extended above all window and door frames and turned up behind the air space.

Concrete Roof Slabs: The use of the concrete roof slab has been accompanied in certain instances (one of which is shown in Fig. 18) by the gradual development of cracks and bulges in the parapet walls, especially at the corners. This has led to the suspicion that the slabs are undergoing expansion and as a result shoving out the wall. The expansion would seem to result from the high temperatures reached immediately under the black, heat-absorbing roof with which many of these slabs are covered.

The provision of adequate expansion joints and, if the outer end rests on the wall, some sort of movable bearing is essential. The slab should be properly insulated against heat and, obviously, protected from becoming wet in any way. Limestone is the best aggregate for roof slabs in view of its low thermal coefficient of expansion. Concrete made from it is little more than half as expansive as that from quartz.

Size of Back-up Units: Whether the use of large back-up units with amounts of mortar much less than in the face brick will result in opening of horizontal cracks in the face was studied through 86 panels erected with various combinations of brick, types of mortar, sizes of backing units, joint widths and workmanship. With 1″ and 3/4″ joints some small openings were observed. They were quite slight with 1/2″ joints and the effect was practically negligible with 3/8″ joints.

Chimneys: The exposure at the top of the chimney, owing to the sulphurous combustion gases, is very severe and demands unusual treatment. A lead-coated copper pan extending over the top and down over the wall inside and out for several inches is recommended.

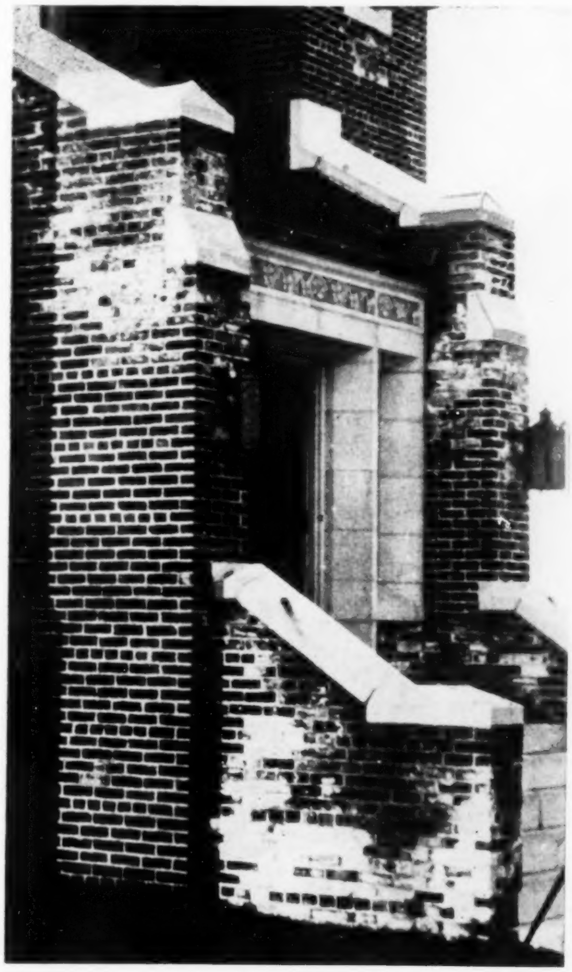


Fig. 16—Flashing should have been used beneath this cast stone trim.

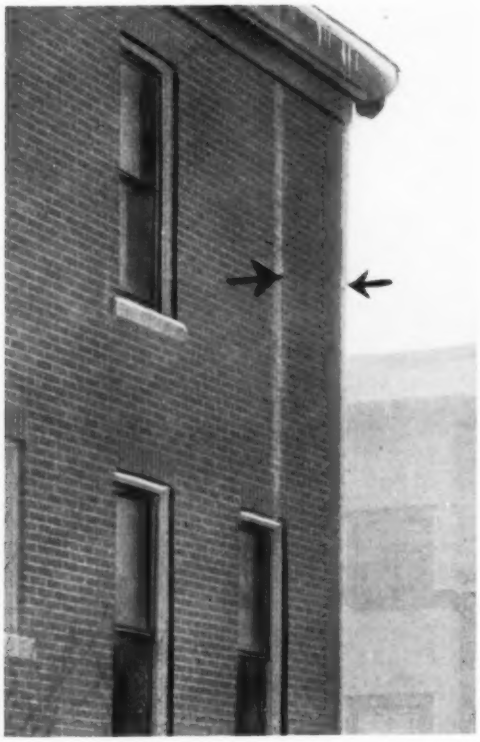


Fig. 17—The gutter material does not extend sufficiently far up under the roofing to prevent moisture from soaking into the brick wall construction when the snow fall is heavy.

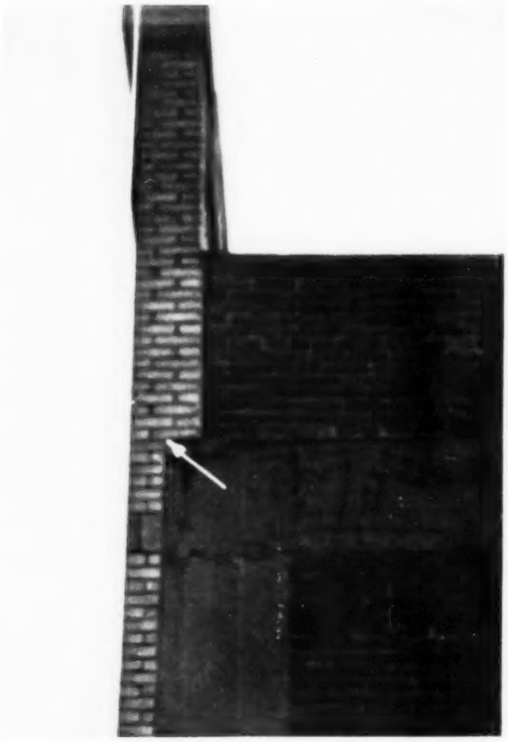


Fig. 18—This parapet wall is two inches out of plumb at the top. Note the broken corner of the roof slab under arrow head. The roof slab was not insulated and at times gets damp from condensed moisture.

Where natural gas is burned, condensation often occurs in the upper part of the chimney and the moisture soaks down into the masonry. The remedy is to put in a double flue lining with an open annular space between, through which a small amount of air from the basement is allowed to pass. The same result can be secured in an old chimney by introduction of an inside pipe of noncorrosive metal to lead away the products of combustion.

Contact with the Ground: Capillary connection between a brick wall and the ground, open porches or the like, should be broken by use of some impermeable membrane. Good results have been secured, however, in garden walls by using properly waterproofed mortar.

Waterproofing Leaky Walls: Where moisture penetrates through minute pores in the masonry, colorless waterproofers of the aluminum stearate or, preferably, paraffin-in-china-wood-oil types may be helpful; but when water enters depressions between the brick and mortar, such treatments are apt to be ineffective. The remedy appears to be the sealing of the openings with waterproofed mortar. It is much simpler and much more economical to build the wall according to the recommendations given in this article than to have to spend large sums in trying to patch a poor job.

BUILDING TRENDS INDICATED BY THE FEDERAL CENSUS—Part 3*

By L. SETH SCHNITMAN

Population growth will have smaller influence on new residential building in the future.

A new building market is opened by the inroads of obsolescence. Little has been done to supply economy housing for the masses at costs they can afford to pay.

The one- or two-family house has become definitely the residential type of the smaller cities and towns. In apartments the smaller centers have also shown relative gains.

One- and two-family houses in smaller cities are still being erected in larger volume than in 1921; for cities of more than 100,000 inhabitants construction of one- and two-family houses is measurably lower than in 1921.

The one- and two-family house ratio in smaller cities will become less important, although this residential type probably will represent at least 50 per cent of all residential building for some years to come.

Even in the smallest cities the apartment type will assume larger importance. In the largest cities economic and sociological considerations are forcing the extension of mass housing in apartments. Residential building will result almost entirely from study of the problems inherent in obsolescence. In this development it appears that large housing corporations will arise whose principal business will be the redevelopment of blighted urban areas on a reasonable rental basis.

In the past the erection of new dwelling units, whether multifamily or single family houses, has been determined chiefly by population growth. Further extension of residential construction must still find large impetus from an expanding population. Nonetheless, significant changes loom in dwelling types of the future if the shifts in population characteristics are carefully weighed and more especially if the building industry is to maintain its present plant and personnel.

On population growth alone the prospects for utilizing existing facilities over the next few years are not particularly bright. A fuller use of these facilities for new building must come largely from the development of a new and untapped market. Provide a practical and continuing solution for the problems of obsolescence in housing and at once such a market is opened, requiring only active and methodic cultivation.

Quantity production and mass merchandising of housing must be geared to insure profitable operations for the building industry. But they will not mesh unless obsolescence becomes an increasingly more important factor in new residential building than it has been hitherto.

The building industry needs an obsolescence and replacement philosophy to combat actively the implications of a declining birth rate, a rise in the curve of celibacy, a diminution of the child-ratio, and the sharp decline in our growth-rate.

*Parts 1 and 2 appeared in the August issue, page 141 and following.

Obsolescence of Buildings

Buildings are obsolete when they no longer are suited to the needs of a population which has been educated to higher living standards.

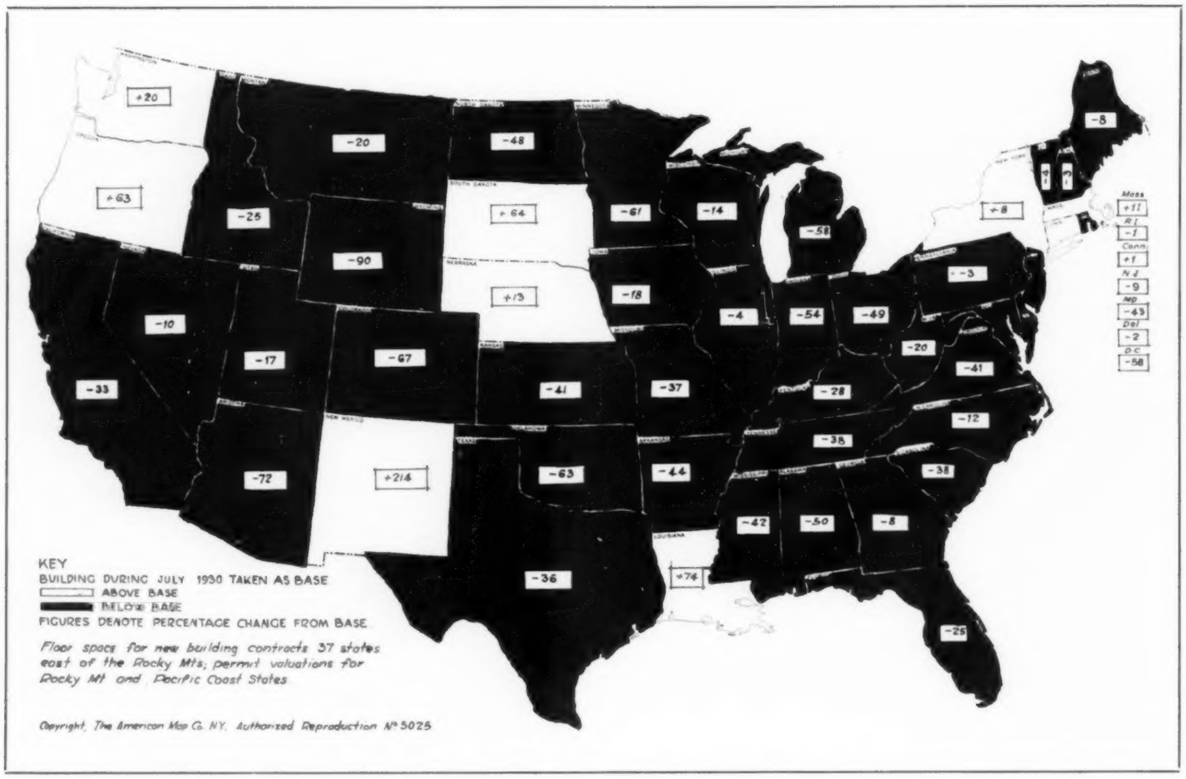
Our population has been educated to housekeeping efficiency and canned foods. It has been taught the wisdom of leisure and the worth of play. But our obsolete residential structures still persist though they no longer suit the changing demands of a population which has been educated to better standards.

Dwellings in Small Cities

More and more the one- and two-family houses have become definitely the residential types of the smaller cities and suburban areas. In 1921 one- and two-family houses erected in the areas outside the cities of 100,000 or more inhabitants represented 42.5 per cent of all such construction in the country at large. Since 1921, practically without interruption, this type increased in importance year by year. By 1930 the small dwelling type in the smaller cities and suburban areas represented 68.3 per cent of all such construction in the country. These small centers in 1930 had a combined population of 32,629,087 or 46 per cent of the urban population of the entire country. For the first half of 1931, due largely to peculiar conditions in New York City, this ratio dropped to 63.5.

Apartment Building

Even as to apartment types the smaller centers have shown measurable gains in importance. For 1921



The July building map showed six states east of the Rocky Mountains where floor space of new building contracts was larger than in July, 1930: Massachusetts, Connecticut, New York, Louisiana, South Dakota and Nebraska.

new apartment house construction in the smaller areas was only 20.7 per cent of the total for the country at large. Since then this residential type has shown irregular gains in our small cities and suburban districts. By 1930 the apartment house type in these areas represented 31.0 per cent of all such construction in the country. For the first half of 1931 apartment house construction in the areas outside of our cities of 100,000 or more inhabitants accounted for only 18.8 per cent of all such construction in the entire country.

Thus it may be seen that even in depression the one- and two-family houses are far more important in the smaller cities and suburban areas than they were a decade ago. At the same time the apartment type is of less importance than it was ten years ago although this class of housing, in the intermediate years, made measurable inroads on the one- and two-family houses even in the smaller cities and suburban areas.

As a corollary the construction of one- and two-family houses in our cities of 100,000 or more inhabitants has shown a declining importance since 1921. In that year these cities erected 57.5 per cent of all one- and two-family houses constructed in the country. Since then, almost without interruption, annual declines in the ratio have been shown, so that by 1930 the ratio was only 31.7. For the first six months of 1931 the ratio expanded to 36.5, principally due to special conditions in New York City.

Practically without exception since 1921 more than 70 per cent of the annual expenditures for new apartment house construction has been concentrated in the cities of 100,000 or more inhabitants. In 1921 this ratio was 79.3; the trend has been irregularly downward, reaching its low point at 69.0 for 1930. For the first six months of 1931 the ratio rose to 81.2.

Comparisons Favor Small Communities

Residential construction as a whole is now running measurably behind the year 1921. This is due chiefly to the declines recorded in the cities of 100,000 or more inhabitants.

For the smaller cities and suburban areas residential building is still proceeding on a higher level than obtained in 1921. In this connection it is of particular significance to note that for one- and two-family houses the smaller areas too are making more favorable comparisons with 1921 than are our largest

(*Continued on page 60, advertising section.*)

Interiors of the

CINCINNATI ENQUIRER BUILDING

are painted for lasting beauty and cleanliness

THE CINCINNATI ENQUIRER BUILDING, Cincinnati's second largest office building. Here 200 gallons of Barreled Sunlight were used to insure interiors of lasting cleanliness and beauty. (Architects: Lockwood Greene Engineers, Inc.)

A VERITABLE hive of industry day and night...reporters, clerks, stenographers, salesmen, buyers, countless others passing constantly in and out of its offices...brushing against walls, inevitably leaving smudges—finger prints. And the dust of a busy city always seeping through windows—through doors...settling on every exposed surface...

How can the walls and ceilings of such a building be kept cheerfully light...clean...handsome without the constant annoyance and expense of frequent repainting?

The management of the Cincinnati Enquirer Building has found the answer—as have managers of hundreds of other modern buildings—in the use of Barreled Sunlight.

Dust or smudges cannot permanently soil a surface painted with Barreled Sunlight. A moist cloth wipes it clean—quickly, easily. Upkeep is economical...in time and money.

Remarkably durable, Barreled Sunlight retains its handsome cleanliness after repeated washings . . . through long, arduous service.

Whether in long-lasting white, or soft, pleasing tints, Barreled Sunlight is conspicuously good looking, with a lustre of rich depth. An all-oil product, it is readily tinted any desired shade with ordinary colors in oil.

Our complete catalogue is in Sweets, but for your own files we would like to send you our booklet, "For Interiors of Lasting Beauty and Cleanliness."

Write U. S. Gutta Percha Paint Co., 22-I Dudley Street, Providence, R. I. Branches or distributors in all principal cities. (For Pacific Coast, W. P. Fuller & Co.)

BARRELED SUNLIGHT is now available in two forms, Interior and Outside. Write for complete information on Outside Barreled Sunlight—its more pronounced whiteness, richer lustre and marked durability.

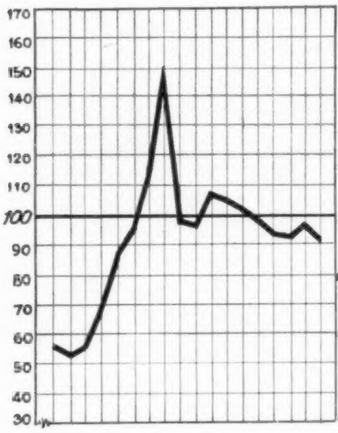
Barreled Sunlight

Reg. U. S. Pat. Off.

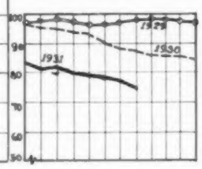
WHOLESALE PRICES FOR BUILDING MATERIALS

1926 Monthly Average = 100

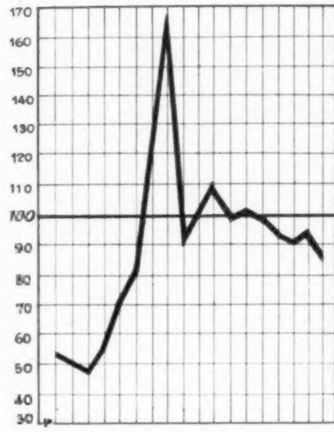
GENERAL INDEX



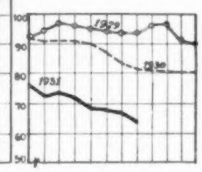
Additional declines in material prices appear imminent; readjustment between major commodity groups is not yet complete.



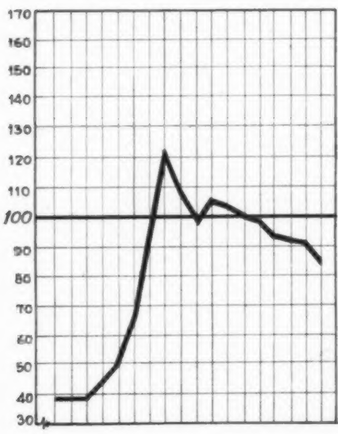
LUMBER



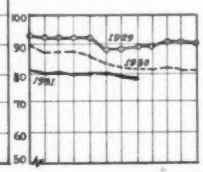
Further price weakness will likely occur in view of disappointing returns on new residential building.



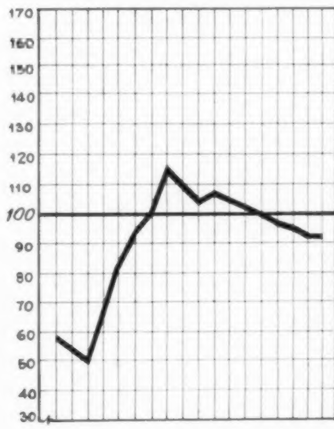
BRICK



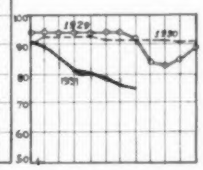
Important declines appear probable, although local building conditions will largely determine price trends.



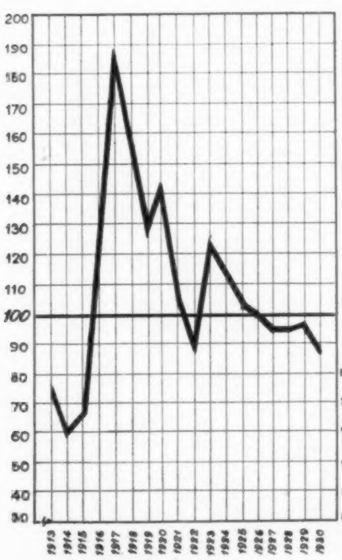
CEMENT



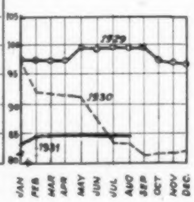
Impending declines in highway work and further indicated losses for most classes of building will likely force lower prices.



STRUCTURAL STEEL

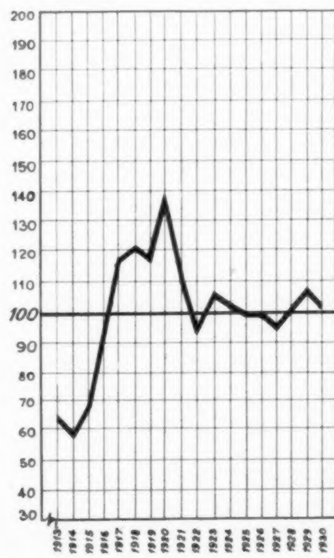


Prices may weaken in face of slow demand but declines should be only moderate.

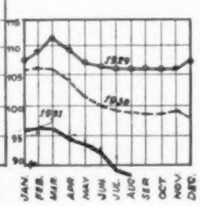


data from the U. S. Dept of Labor.

OTHER MATERIALS

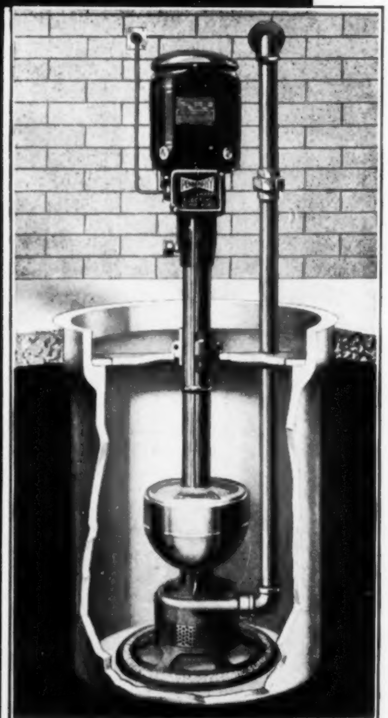


Further declines for group are indicated, particularly for glass, prepared roofing, lime and pipe.

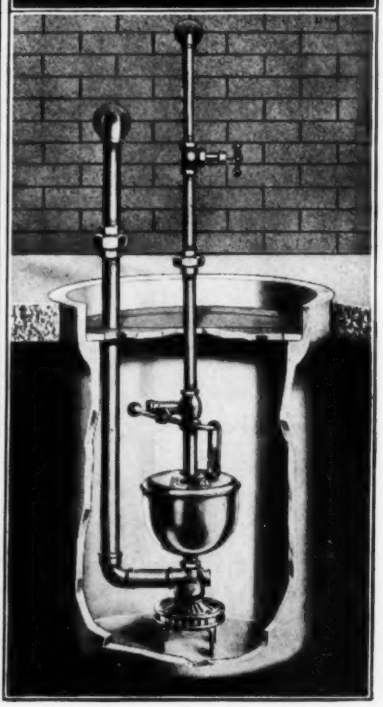


RUST PROOF

COPPER AND BRONZE THROUGHOUT



PENBERTHY
AUTOMATIC
ELECTRIC
SUMP
PUMP



PENBERTHY
AUTOMATIC
CELLAR
DRAINER
(Water Operated)

PENBERTHY PRODUCTS

THE architect need not be told the many advantages of using copper and bronze in the construction of equipment for the removal of seepage water from basements, elevator sumps, piping tunnels, scale pits, etc.

Penberthy Automatic Electric Sump Pumps and Automatic (water operated) Cellar Drainers are built of copper and bronze throughout . . they cannot rust.

The design and workmanship of Penberthy Pumps are as outstanding as the quality of the materials used in them. Consequently, these pumps are trouble-proof as well as rust-proof.

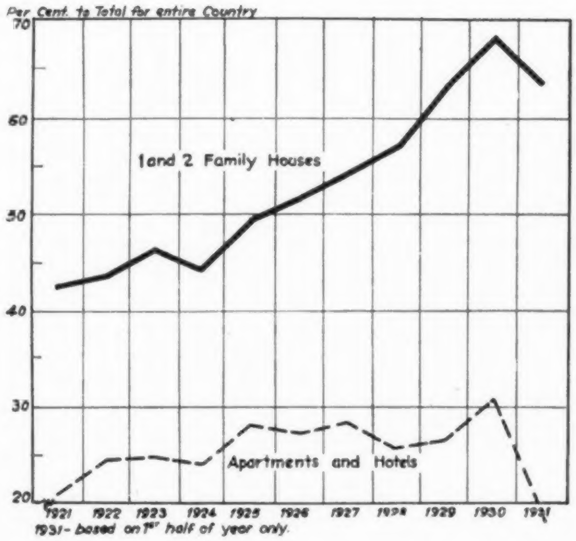
There is a type and size of Penberthy Pump for every purpose. Sump covers for both electric and water operated units can now be supplied at slightly additional cost. Penberthy Pumps are stocked by leading jobbers everywhere.

PENBERTHY INJECTOR COMPANY

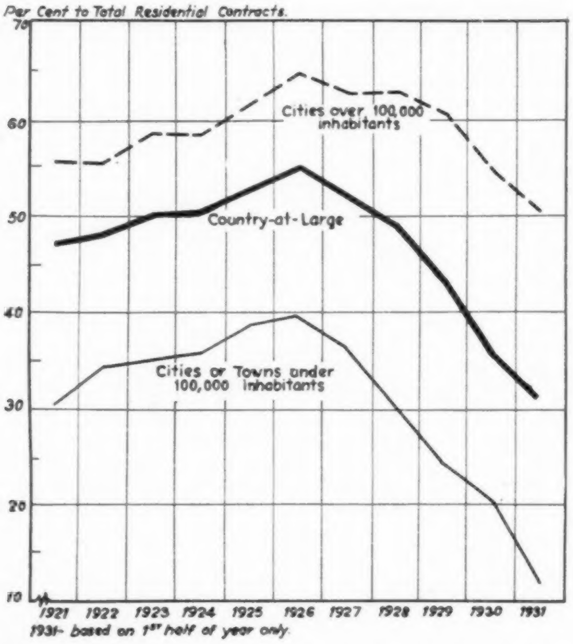
Established in 1886 | DETROIT | Canadian Plant Windsor, Ont.

PENBERTHY PUMPS
REMOVE SEEPAGE WATER

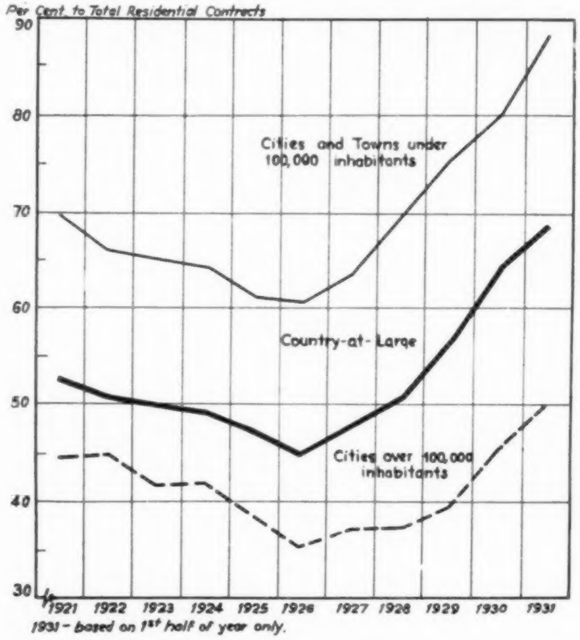
Residential Construction in Cities having 100,000 or more Inhabitants, 1921—1931, showing percentage relationship between each principal residential type and same type for entire country, based on contract values.



Residential Construction in Cities and Towns having less than 100,000 Inhabitants, 1921—1931, showing percentage relationship between each principal residential type and same type for entire country, based on contract values.



Distribution of Apartment House and Hotel Construction, 1921—1931, showing percentage relationship, on a valuation basis, between new apartments and hotels and total residential construction for the indicated areas.



Distribution of One- and Two-Family House Construction, 1921—1931, showing percentage relationship, on a valuation basis, between new one- and two-family houses and total residential construction for the indicated areas.

(*Continued from page 216, editorial section.*)

cities, while in the case of apartment types both large and small cities are on a much lower level than they were in 1921.

For the country at large one- and two-family houses in 1921 were 52.7 per cent of all residential construction, but by 1926 they had dropped to only 45.0 per cent of the total. From this point they recovered their relative importance and for the first half of 1931 stood at 68.6 per cent of the total.

For the cities of 100,000 or more inhabitants one- and two-family houses in 1921 accounted for 44.6 per cent of the total new residential building in these cities; this ratio declined annually until by 1926 it stood at 35.4. For 1927 it had recovered to 37.1 and by the first half of 1931 it reached 49.6, somewhat exceeding the ratio of 1921.

For the smaller cities and the outlying suburbs one- and two-family houses erected in 1921 represented 69.6 per cent of all residential building undertaken

in those areas. From that year forward this residential type declined in relative importance until by 1926 the ratio stood at 60.6. For 1927 the ratio recovered to 63.6 and for the first half of 1931 stood at 88.1, considerably higher than at any previous time in recent years.

Changing Residential Types

From a study of these diverse movements the impression may be gained that for our largest cities, i.e., those of 100,000 or more inhabitants, one- and two-family houses are for the moment showing greater ability to stabilize, and that therefore this type of housing will continue in the future with at least the importance obtained in the past. Such a conclusion, however, is not warranted in the face of the changing requirements for space which are being dictated by our changing sociological structure.

The recent decline in speculation which bulked particularly large during the period 1927–1929 has caused the rising ratio for one- and two-family houses, and hence no large significance should be attached to this phenomenon. Once readjustment in real estate structure in the largest cities has been more nearly completed and foreclosures and deflation become of less consequence, particularly as respects apartment and hotel types, we may expect to see the decline in the one- and two-family house ratio resumed.

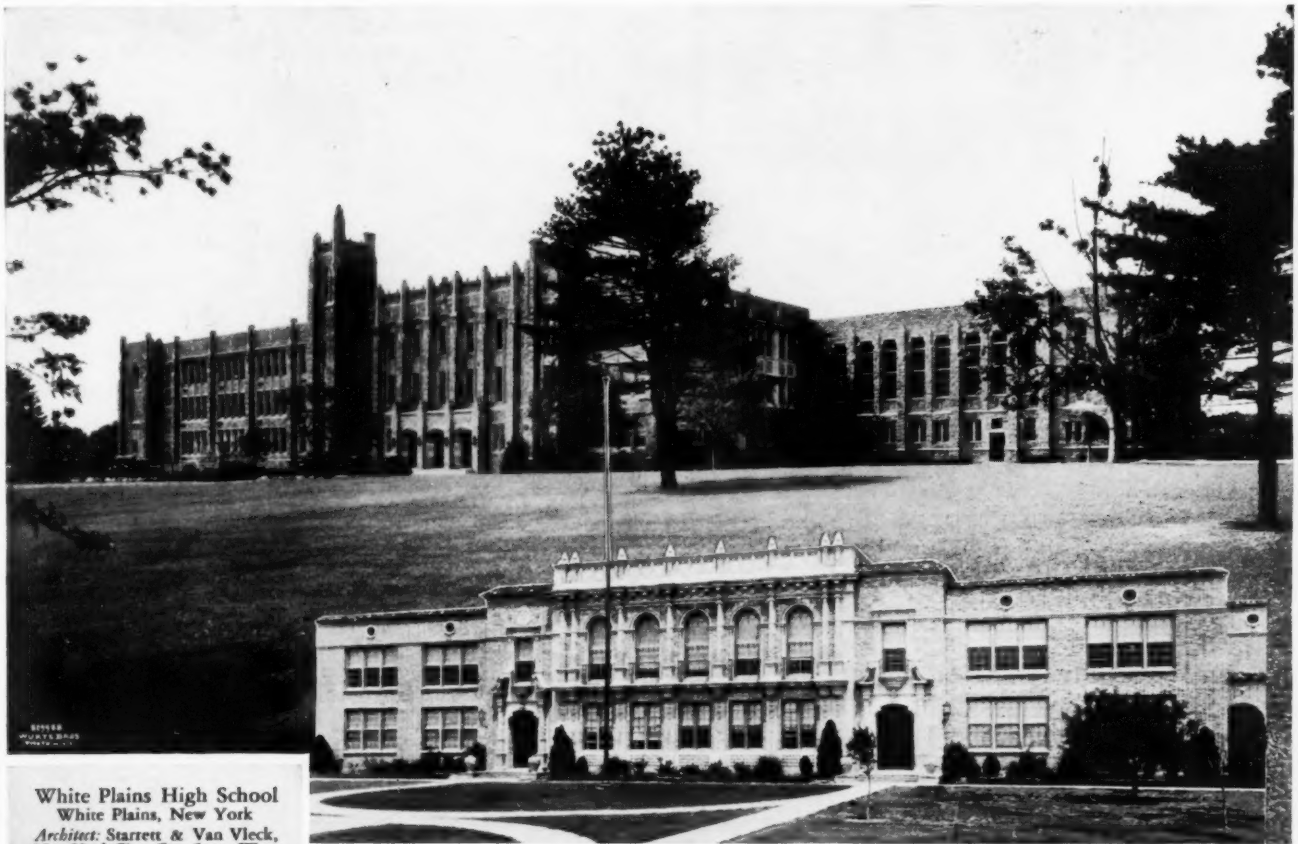
When the processes of deflation shall have run their full course we may expect to see the one- and two-family house ratio in our smaller cities and abutting suburbs decline from the points attained during the past three years, ultimately dropping below the lowest recent ratio of 60.6 recorded for 1926.

Although the one- and two-family houses will for some years to come probably represent at least 50 per cent of all residential building undertaken in our smaller cities and towns, here, too, the changing habits of our people will induce changing residential types in which the apartment house will assume larger importance.

It is here that real estate men have learned the lessons of excessive and uncontrollable speculation in real estate, particularly in subdivisions. It is here that the real estate world, our financing agencies, and the public are resolved to exercise a greater measure of control than ever before through their local boards, using to this end more frequent and more accurate surveys of local needs. It is here that co-operation with city and town planning officials will produce an effective bulwark to the haphazard city growth that has characterized the past. It is here that more efficient communities can be established with relative ease since land still abounds at relatively reasonable prices. These smaller cities and towns will thus find a more methodic application of the principles of mass merchandising, and in the processes the multifamily house, with modifications suited to the new sociological and economic tempo, will play a larger role.

Problems of Large Cities

For our largest cities the problems are naturally different. Population is already concentrated. Busi-



White Plains High School
White Plains, New York
Architect: Starrett & Van Vleck, New York City, *Gen. Contr.:* Wm. Busse, Portchester, N.Y., *Heating Contr:* Frank Farrell, Newark, N.J.

Harlingen High School
Harlingen, Texas
Architect & Engr: Dewitt & Washburn, Dallas, *Gen. Contr:* W. A. Velton Constr. Co., Brownsville, Tex., *Heating Contr:* Dallas Heating & Vent. Co., Dallas, *Plbg. Contr:* McCarty Plbg. Co., Harlingen

Buildings Worthy to Inspire the COMING GENERATION

THE beauty, dignity, and appropriateness that have characterized American school architecture more and more in recent years, are well illustrated in the splendid buildings here shown. Comfort, convenience, and enduring usefulness have been provided for in all the details of planning and equipping them, within and without.

For the services in which pipe has an important though inconspicuous place, in these as in other like examples from New York to Texas, the major tonnage was NATIONAL Pipe. Thus, in the designing and construction of schools, as with large building enterprises generally, the preference for NATIONAL has definitely established it as—

America's Standard Wrought Pipe

Junior High School
New Rochelle, N. Y.
Architect: Starrett & Van Vleck, New York City, *Heating Contractor:* Gillis & Geoghegan, New York City

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL PIPE

ness and industrial areas, though constantly shifting and expanding, are more or less firmly entrenched. Residential needs are essentially different from those that obtain in our smaller cities and towns. The emancipation of woman and her increasing absorption into our economic scheme has had large influence; rising taxes have become more burdensome; the size of the family has become noticeably smaller; the dwelling unit has become more a place for shelter and sleep than a place for recreation; and in the transition housekeeping efficiency has dictated economy housing. It is in these cities, in the light of these changing conditions, that we may expect a further adaptation of the multifamily housing principle. The extension of residential building in these cities will come almost entirely from the solutions of the problems inherent in obsolescence.

Opportunities for Housing Projects

It is a justifiable boast of the engineering age that methods of mass production improve the product, lower the cost, enlarge the market and raise the living standards of the masses. So far the principles and benefits of mass production have not been translated into housing standards for the masses at costs which they can pay. The only form of housing that has yet been developed which effects any reasonable economies by wholesale production is the well-planned apartment building; even here, cost economies have not yet been sufficient to offer new living accommodations at rentals which the average American family can afford to pay.

The stage appears set for the creation of large housing corporations whose principal business will be the redevelopment of blighted urban land on a reasonable rental basis. In this process the apartment house will figure to an even larger extent. Even in suburban developments planning experts have found that a certain proportion of apartment buildings to a given number of free-standing houses contributes to more economic use of the land and the necessary public utilities.

As we look forward to the revival of residential building as the provider of business prosperity we face the probability of many changes—new ideas in financing, new ideas in building, and new ideas in merchandizing to fit the housing dollar of the masses and their desires for better living standards.

LIGHTING CLASSROOMS IN CHICAGO

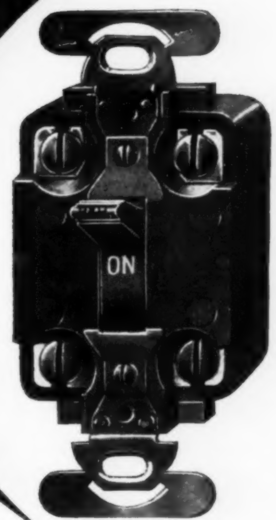
Artificial lighting of schoolrooms is of greater importance in Chicago than in many cities because the congested conditions in Chicago require the use of some of the schools daily for two complete school sessions. Chicago's northerly location and climatic conditions cause an unusually large number of dark days during the school year.

Every effort has been made to work out an efficient system of lighting for all rooms in school buildings which would give necessary light at minimum cost.

H & H Flush TUMBLER

TYPE "C"

New 20 Ampere & 30 Ampere



Specially-built

Switches

for Type "C" Lamps

BUILT by the switchmakers *first* to develop a specially-made switch to control high-watt lighting in stores, offices, hotels, factory buildings. The "Type C" 30-Ampere switch has current-carrying parts *three times heavier* than ordinary flush switches. . . .
For controlling loads not so heavy as the "THIRTY", the new "TWENTY" is specialized for *medium*-size gas-filled lamps. No higher *in price* than similarly-rated switches *not* specialized for the smashing current-surge through Type C lamps.

Designed and developed by "Switchmakers since 1890"—the first in meeting *new needs*

The TWENTY and THIRTY Amp. "Type C" Switch is no common Tumbler with a higher rating to substitute for a specially-built high-wattage control. Its construction follows the tested principle of the H & H Panel-Board Switch, with blades of a special phosphor bronze having extraordinarily large surfaces for absorption and dissipation of heat. Two arc-snuffers cut off the arc, greatly increasing current-breaking capacity. » »

Handle, top, base and back are of BAKELITE, as is all insulation in mechanism. Automatic kick-off release removes all chance of switch sticking or failing to operate. Fits standard deep wall boxes; used with brass or BAKELITE wall plates. Supplied in *Lock Type* where locking is necessary to prevent tampering with lights in public places. Approved by Underwriters Laboratories; write for data-sheet listing complete line. » »

HART & HEGEMAN DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC CO
HARTFORD, CONN. MAKERS OF ELECTRIC SWITCHES SINCE 1890

GENERAL SCIENCE ROOM
AUSTIN SENIOR HIGH SCHOOL, CHICAGO
J. C. CHRISTENSEN, ARCHITECT

After much study and experimenting, a simple stem type of fixture with a closed semi-indirect bowl was adopted together with a uniform scheme of classroom decoration of such colors, shades, and finishes as would provide for the most efficient reflection and diffusion of light from the fixtures. The use of the stem type of fixtures permits a varying height of fixtures to secure the desired intensity at a desirable height above floor level.

In our standard 24′ by 30′ classrooms, the fixtures can be hung 9′ above the floor. Six fixtures spaced so that the zones overlap will produce a uniform lighting of even intensity throughout the entire room at a point 30″ above the floor with one 100-watt lamp in each fixture.

A similar method of lighting used in special rooms, such as sewing rooms, mechanical drawing rooms and laboratories, produces equally satisfactory results with a 200-watt lamp in each fixture.

Shops are lighted with steel reflector glass diffuser units and spacing which permit the use of a 200-watt lamp in each unit and which give double the intensity provided in a classroom. This has been found to be most satisfactory.

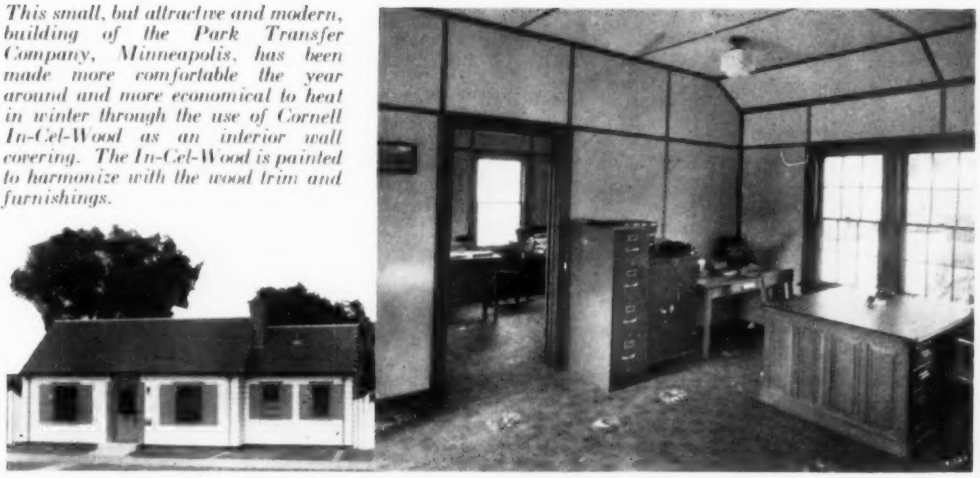
Illuminating engineers who have visited Chicago schools praise the lighting of the gymnasiums. Gymnasium lighting fixtures are recessed type ceiling lights having a protective grating flush with the finished surface of the ceiling and containing a spring socket for the lamp.

Classroom walls are decorated in a light brown or gray below the blackboards. A light buff is used between blackboards and ceiling, and the ceiling is practically white. Ceilings and walls above blackboards have a flat gloss and walls below blackboards have a high gloss. The Bureau of Standards' "School Brown" is used for all furniture and for all interior woodwork in classrooms.

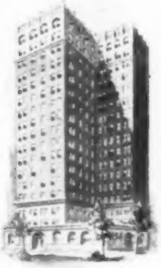
The average lighting load for room lighting is approximately one watt per square foot of floor surface. The entire area of the building is included in such calculations.

Ralph W. Yardley, *Assistant Architect*
Board of Education, Chicago

This small, but attractive and modern, building of the Park Transfer Company, Minneapolis, has been made more comfortable the year around and more economical to heat in winter through the use of Cornell In-Cel-Wood as an interior wall covering. The In-Cel-Wood is painted to harmonize with the wood trim and furnishings.



For Any INSULATING Job

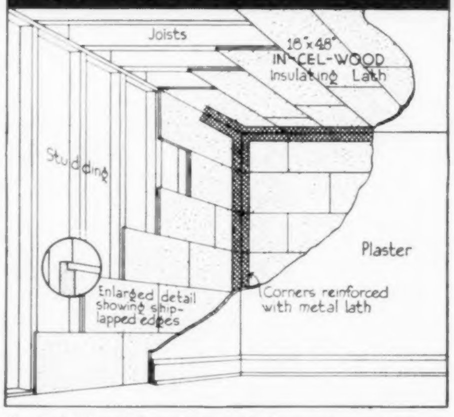


Wherever there is a need for efficient insulation of heat or sound—in outer walls—under roofing—above ceilings—under flooring, or in interior walls and partitions—Cornell In-Cel-Wood measures up to the most exacting requirements.

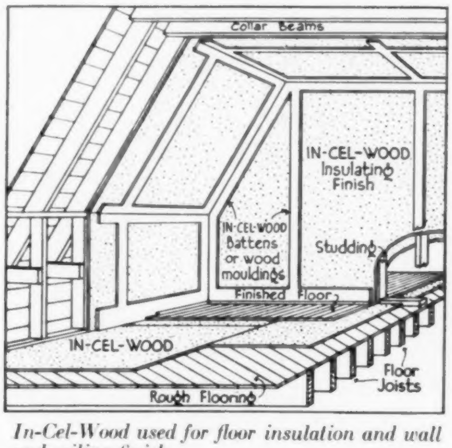
In-Cel-Wood offers advantages which are combined in no other insulating material.

In-Cel-Wood is full ½ inch thick. It has the extremely low density of 14.4 lbs. per cubic foot. Its thermal conductivity is only 0.32 B.T.U. Because of its high efficiency this modern insulation reduces heating costs from 25% to 40% per season. In new construction, In-Cel-Wood adds little if any to the cost of the building. It can be used as a structural board as well as insulation, replacing ordinary sheathing, plaster lath or interior wall finish. Standard sizes, 4 x 6, 7, 8, 9, 10 and 12 ft.—full ½ inch thick. In-Cel-Wood lath (with ship-lapped edges) 18″ x 48″—full ½ inch thick. For complete facts mail the coupon below. Cornell Wood Products Company, 307 No. Michigan Avenue, Chicago, Ill.

Installation Details For Interior Uses*



In-Cel-Wood Insulating Lath used as plaster base on interior walls and ceilings.



In-Cel-Wood used for floor insulation and wall and ceiling finish.

Cornell
IN-CEL-WOOD
"It's in the Cells"

★ From the SPECIFICATION MANUAL

For other diagrammatic sketches, showing the use of In-Cel-Wood in various types of exterior walls and roofs, see the advance reprint of the Cornell Catalogue in the forthcoming 1932 edition of Sweet's. Contains complete facts and specifications. If you have not received a copy or have mislaid your copy, sign and mail the coupon now.

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Without obligation to me please send—
☐ Specification Manual on Cornell In-Cel-Wood
☐ Sample of Cornell In-Cel-Wood
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FEE OR LUMP SUM?

In recent numbers of architectural magazines I have seen several articles which seem to indicate that many architects are dissatisfied with the percentage system of computing fees and are advocating a change to other methods. There have also been several items which seem to suggest that the architect has a reputation for lack of business ability.

Whether there is any relation between these two phenomena or not, I cannot say, but it seems strange that at the time the contractors and others are making every effort to get away from the evils of the lump sum contract and substitute a percentage fee, architects should be striving to do the reverse.

With the tremendous increase and complication of modern apparatus and mechanical equipment, it is becoming more apparent every day that an increase of fees will have to be considered in the not distant future. Our fees must be revised upwards and not downwards.

The percentage system has been a normal development and is recognized universally. After a good deal of effort on the part of the Institute the 6% is also firmly established. I suppose there is no fee anywhere so firmly established by custom and law as the architect's 6% and it would be foolish to throw away the result of so much effort.

I don't know anything about the profits that can be made on the super-buildings of New York and Chicago, but I do know that on normal buildings up to two or three million dollars, if the work is done properly, 6% affords only a modest profit, and on smaller buildings, hardly a living wage.

It would be comparatively simple and probably not a very long process to increase the 6% to 7% and have it generally recognized, but it is proposed to change the system to another, either:

A. Cost of draftsman's wages, plus overhead, plus profit.

B. A lump sum fee.

The formula suggested for "A" is wages one-third, overhead one-third, and profit one-third.

The average business man knows nothing about the architect's expense. Just imagine his astonishment on being asked to pay 200% for the architect's overhead and profit, and also the probability of his paying it, and then if he felt he were paying under that system, how jealously he would watch the draftsman's time and other expenses. Often a draftsman will spend days in studying and refining the details of a project. The average owner would object to paying 100% because he is accustomed to figures of 10% to 20%, and think how 50% net profit would appear to, say, a department store manager whose mouth would water at 5%.

No, that system is only going to open the way for interference by clients and cause us a great deal of unnecessary grief.

As for "B", it is really unworthy of serious consideration as it would immediately degenerate into a system of competitive bidding and then we might as well close our offices.

JOHN GRAHAM, *Architect*
Seattle